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The findings of this study are the personal responsibility of the author and, as such, have not been endorsed by the Economic Council of Canada.

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Understandably, in a work of this nature a number of debts have been incurred. I would like to acknowledge the assistance of Louis Beauséjour of the Department of Finance during the period of procuring the model and becoming familiar with its intricacies. Similarly I benefitted from several lengthy discussions with one of the model's original developers, Rich Jones, at the University of Western Ontario.

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Foreword

This study is part of the research effort that led to the publication of the Economic Council's 28th Annual Review, *A Joint Venture*. The Review assessed the nature of the economic linkages among the provinces and discussed various aspects of policy harmonization within the union. It also investigated the fiscal relationships between the provinces and the federal government and debated key issues such as the appropriateness of national standards, the allocation of powers between levels of government, and the problems created by overlapping jurisdictions. The last part of the Review was devoted to a qualitative and a quantitative assessment of some of the costs and benefits attached to various political models that could emerge from the current constitutional debate. Issues relating to the transition phases towards a new form of confederation were also discussed.

This study by Andrew Burns served as a main background piece to the section of the Review assessing some of the costs and benefits of various political structures. Specifically, the paper describes the general equilibrium model used to evaluate the long-run impacts on each of the Canadian regions of the fiscal arrangements associated with four stylized constitutional options: a moderately decentralized federation, an extensively decentralized federation, a confederation of regions where the federal government's role is reduced to a minimum, and a Quebec-Canada sovereignty/association scenario.

As stressed in the Review, no model, no matter how sophisticated, can capture the full economic impact of such comprehensive changes in political structure and division of powers. Accordingly, the study here focuses explicitly on the long-term consequences of changing the complex system of fiscal transfers and taxes which are currently binding provinces together. Other features of the current federal system, such as commercial and corporate linkages between provinces, are assumed to remain unchanged throughout the analysis. To acquire a better sense of the comprehensive economic impact of the political scenarios under study, the reader should refer to the broader discussion presented in Chapter 5 of the Review.

The work on this background paper was completed after the release of the Review. This has allowed for the correction of an oversight in the construction of the model data base. Published economic accounts do not take proper account of a special tax agreement between the federal and Quebec governments. Under the terms of the so-called special Quebec abatement, the Quebec government receives some of its federal transfers in the form of ceded income tax points. In order to insure that this implicit transfer to Quebec is incorporated into the analysis, some adjustments are necessary to the source data on federal/provincial transfers. The results published in the Review do not reflect these adjustments. The results presented in this paper are therefore slightly different from the ones published in the Review. In particular, the reader will note some significant changes in the impact of the moderate decentralization scenario. In all other cases the results are very similar, if not totally unchanged, to those published earlier in the Review. Most importantly, these changes do not affect in any way the analysis, discussions, and main conclusions found in the 28th Annual Review.

Judith Maxwell
Chairman

READER'S NOTE

The reader should note that a conventional symbol similar to that used by Statistics Canada has been used in the tables:

. . . figures not appropriate or not applicable

Details may not add up to totals because of rounding.

1 Introduction

This study evaluates the long-run impacts of four alternative forms of fiscal federalism on each of the Canadian regions. The first three envision a Canada where the federal government's relations with the different provinces remain largely symmetrical but in which responsibility for federal programs is increasingly transferred to the provinces. In the fourth scenario, treatment of the provinces is asymmetrical, as the transfer of program responsibility is made to one province alone.[1] It is assumed that all changes are undertaken in a calm and peaceful political climate, not because this is necessarily the most likely result, but because it provides a convenient benchmark, which limits the extent to which the analysis would be muddled by arbitrary and subjective assumptions as to the extent of political disharmony and acrimony from one scenario to the next.

In the analysis, fiscal federalism is taken to mean the entire system of federal and provincial taxes, transfers, and expenditures. In the interest of clarity, those features which are institutional or regulatory in nature, such as marketing boards, procurement policies, and policies which obstruct the free flow of goods (i.e., provincial liquor laws), are explicitly excluded from the analysis. In order to be modelled, such programs/policies require important assumptions as to their size and influence in the status quo, for which little or no objective data exists. The restricted definition of fiscal federalism ignores, therefore, a number of factors which are likely to be important in any eventual reconfederation. In doing so, however, it permits an in depth analysis of a substantial subset of the changes contemplated with a minimum of controversial assumptions.

In the first scenario, the federal government withdraws from a number of areas where the federal and provincial governments currently exercise joint authority: health care, post-secondary education, welfare and training. The second scenario builds on the first and analyses the impact of a transfer of responsibility of all programs included in the first scenario, as well as a number of federal programs which deal more directly with individuals; such as, the unemployment insurance system, family allowance, social security, official languages, transfers and subsidies to business, crop insurance and agricultural subsidies *inter alia*. The third symmetric scenario examines a radical decentralization where federal responsibility is limited to a few areas, including defence, justice, and international relations. Among the additional federal programs which are eliminated in this scenario are: equalization, culture and amateur sport, and native issues. The fourth scenario examines the regional impact of severing the federal government's fiscal ties with Quebec.

Changes in fiscal structure as important as these will engender significant changes in economic structure, resource allocation, and the pattern of demand and supply. The technique used in this paper, Computable General Equilibrium (CGE) analysis, is sufficiently flexible to capture the important structural changes likely to be observed in the wake of a radical change in fiscal structure. The CGE analysis, similar to that used here, has become commonplace in the evaluation of major changes in public policy. Recently it has been used to analyse the impact of the Canadian Goods and Services Tax [Hamilton and Kuo 1989], the Canada-U.S. Free Trade Agreement [Harris 1984] and the regional impact of various national policies [Jones and Whalley 1990].

The model employed in this paper was developed by Professor John Whalley, University of Western Ontario, and was used to evaluate the regional impact of the National Energy Policy, the federal equalization program, as well as various other federal programs with regional content, for the Macdonald Commission on the Economic Union. A complete model description, discussion of its characteristics, and an analysis of the economics of confederation in 1981, is contained in the volume *Regional Aspects of Confederation* [Whalley and Trela 1986], as part of the Macdonald Commission. More recently, the model has been used to evaluate the contribution of all federal programs to regional welfare [Jones and Whalley 1990]. This paper builds on this previous work by: 1) employing a new data base more reflective of today's tastes and technology; 2) employing the most recent data as to the structure of fiscal federalism; and 3) examining a continuum of programs.

This paper is divided into seven sections: 1) the introduction; 2) a description of CGE models in general terms; 3) a description of the Whalley model in particular; 4) a section which deals with the data used to calibrate and simulate the model and which describes the manner in which results should be interpreted; 5) a description of the scenarios modelled, as well as of their results; and 6) a summary of the results and some additional commentary. We close with a brief concluding section.

2 CGE Models: an Overview[1]

The Computable General Equilibrium (CGE) framework permits economists to model the functioning of the economy in a manner which is faithful to the fundamental tenets of economic theory. All activity in CGE models derives from individuals' efforts to satisfy their demands for goods and firms' efforts to maximize profits. These efforts, through the market mechanism, determine the structure of the economy, the particular production processes employed, the amount of trade between regions and countries, the quantity of goods produced and demanded, prices, the return to capital, wages, salaries and incomes. All of these features are sensitive to changes in taxes, in the initial endowments of individuals, and in government spending on goods, services, and transfers. Unlike macroeconometric models, whose structure and behaviour is dependent upon the policy regime under which they are estimated, CGE models' structure and behaviour take the policy structure as datum and respond to changes in that structure in a manner consistent with optimizing behaviour. It is principally this characteristic of CGE models which makes them the tool of choice when analysing major changes in the structure of taxes, government spending and transfers.

Almost all modern economic theory begins with the assumption that individuals (consumers) seek to acquire goods in order to maximize individual satisfaction (what economists call utility), and that firms organize production so as to maximize their profit. The processes of individual utility maximization and firm profit maximization are interdependent. In the CGE model framework, consumers own the capital and provide the labour which firms use to produce output (whence profit), while firms produce the goods which satisfy individuals' desires. Both individual wants and firms' profits are limited by endowments and technology. The possible level of consumers' satisfaction depends on their preferences for goods, the prices of goods, and the quantity and price of their initial endowments, which provides them with the income necessary to consume. Firms' profits are limited by range of available productive technologies, the price of their output, and the prices of their inputs.

The activities of utility maximizing consumers and profit maximizing firms create markets where goods and services are offered for sale and where demands are met. The competing offers and demands for services and goods serve to determine final market prices, as well as wages, incomes, the quantity of goods demanded and supplied, and such familiar economic aggregates as GNP, GDP, labour productivity, exports and imports.

CGE models make extensive use of a central result in theoretical economics which shows that under certain relatively weak conditions concerning the nature of individual preferences, technology and markets, there exists a unique set of prices for goods and factor services consistent with zero excess demand for any one good, and such that no agent (producer or consumer) can by means of an additional trade at these prices increase profits or improve their level of satisfaction.[2] Satisfaction of these conditions is both necessary and sufficient to ensure that, given knowledge as to consumers' endowments of capital and labour and their preferences for goods and services, as well as the productive technologies available to firms, one can determine the prices for which goods and services would trade in a competitive market. It follows from the necessity of these conditions that if one were to observe an equilibrium and know the initial endowments of agents, then, assuming that the *general* mathematical structure of preferences were known and sufficiently restrictive, it would be possible to identify exactly both the technology of production and individual preferences on the basis of the one observed equilibrium.[3] This process, whereby the skeleton of a general equilibrium model is confronted with an observed equilibrium in order to identify tastes and technology, is called calibration and is crucial to the process of CGE modelling.

Once technology and preferences have been revealed in this manner, it becomes possible to reproduce the initial data set (including prices, quantities demanded and supplied, patterns of trade, wages and salaries, and the return to capital), by simply calculating the prices which would be consistent with that technology and preferences, and the initial endowments. These prices and endowments would in turn be sufficient to determine quantities demanded and supplied of factors and goods, as well as the flow of commodities between regions. In fact it is possible to replicate all of the initial data set. This replication acts as a check on the process of calibration.

In addition to the general framework of consumer preferences, technology and initial endowments, CGE models normally add information as to the nature of taxes,

government transfers and expenditures. This information, like endowments and the assumptions as to functional form of preferences and technology, constitutes initial conditions in the model, which, among other things, condition the calibration process. Once the model has been calibrated and the initial data set replicated, initial conditions (such as fiscal structure) can be changed and a new counter-factual equilibrium solution produced. The new solution will, just as was the case for the replicated data base, include information as to quantities produced, demanded, supplied and traded, as well as prices, wages and salaries. The fact that initial conditions are changed, however, means that the new equilibrium values will be different from the old.

Both a strength and a weakness of the CGE model framework is that the policies which can be modelled are limited by the information included in the initial data set (i.e., taxes, transfers, tariffs, duties and other such policy handles). The influence of taxes, regulations and policies which are not explicitly described in the equilibrium data set is incorporated into tastes and technology during the calibration process. If a policy which has the effect of increasing the demand for goods produced in one region is not explicitly modelled, the calibrated tastes and technology of all agents will be biased towards these goods. Because the policy's influence is not explicitly modelled, it will appear that agents prefer the goods of the favoured region more than they actually do. As long as the policy is not changed, the bias does not represent a problem. If, however, we wish to model the removal of the policy, it must either be incorporated into the equilibrium data base and the model recalibrated or, we must "estimate" its impact on tastes and technology outside of the model and make an adjustment to the calibrated parameters. The problem with this second technique is that the simulation results derived will only be as good as our estimate of the policy's impact. The value added by the model will be negligible.

The information necessary to model the effects of a tax or transfers is relatively easy to come by. Other policies or institutions, such as interprovincial barriers to trade, special procurement policies and marketing boards, are more problematic because one has no way of knowing exactly how they influence economic agents' behaviour in the observed equilibrium. The effect of taxes and transfers on prices and budget constraints is explicit: a tax operates by driving a wedge between the price paid by the purchaser and the price received by the seller, thereby changing the incentives presented to each, causing the quantity demanded and supplied to change from what they would have been in the absence of the tax. Transfers operate by altering the budget constraint of agents, increasing or decreasing their ability to purchase goods. Policies such as marketing boards, on the other hand, do influence prices and budget constraints but in a manner and extent which is difficult to determine. In order to model these policies, certain assumptions as to how they impact prices and budget constraints in the equilibrium data set must be made. These assumptions can be implemented as tariff equivalents (a combination of pseudo taxes and transfers) in the equilibrium data base. The model must then be recalibrated in order to allow tastes and technology to incorporate the additional information as to initial conditions. The impact of removing the tariff equivalents (the policy) can then be simulated in the same way as for a tax.

The problem with this approach is that the results derived from these simulations will depend entirely upon the assumptions made as to the size and nature of the tariff equivalents. The CGE model is not improving our understanding of the influence of these programs because, in order to incorporate them into the model in the first place, their influence has to be "known".[4] The value added provided by the model is zero. It is for this reason that the influence of marketing boards, interprovincial barriers to trade and government procurement policies are not included in the present modelling. Although these factors most certainly constitute important aspects of the Canadian economic union, their influence is more appropriately estimated using other techniques. The present analysis is limited to those features of fiscal federalism which can be objectively measured, the system of federal-provincial taxes and transfers.[5]

The impacts of a policy change will be felt throughout the economy, not just upon those immediately affected. For example, an increase in the rate of tax charged on manufacturers' intermediate output will cause the demand for manufactured goods as an input into other goods to fall. As a result, the price of manufactured goods will decrease as will the manufacturing industries' demand for inputs and factors. Similarly, the price of goods which use manufactures as an input will increase and the demand will fall, reducing these industries' demand for factors. Other sectors which use little or no manufactures will see an increase in demand for their goods as individuals substitute away from the now higher priced manufactured goods. This will cause these industries' factor demand to increase. The price of factors may increase or decrease depending upon whether or not the manufacturing industry is relatively intensive in its use of one factor, and depending upon the relative mobility of factors. Each of these changes will, in turn, provoke secondary changes and tertiary changes *ad infinitum*. Once all adjustments have taken place, wages and incomes of individuals will have changed depending on the ultimate change in the price of the factors whose services they sell. Individual utility (satisfaction) will have increased or

decreased, depending upon whether or not the combination of new prices for consumption goods and new income allow them to purchase a bundle of goods producing more utility than previously.

The fact that the manner in which goods are produced is allowed to change in response to policy changes, constrained only by the limits of known technology, implies that the simulation results are "long-run" results.[6] In practical terms this long run represents at least twenty years given the average life of capital goods. This, plus the static nature of CGE models, makes them ill-suited to investigating the short-run or transitional costs associated with policy shocks. Other economic tools are more apt at dealing with these effects.[7]

The endogeneity and optimizing nature of individual and firm behaviour within the model means that the new outcome, as was the case in the initial equilibrium, will represent the best that people can do given the policy regime simulated. The impact of the modelled change can be inspected by comparing conditions before and after the shock. Typically, impacts are evaluated in terms of changes in welfare.

CGE models' focus on the welfare of individuals represents a conscious choice. A given policy change will change prices, taxes collected, the mix of goods produced and the mix of goods consumed. All of these changes are in and of themselves interesting; they have implications for GDP, labour productivity, incomes, and the level of employment in different industries, all of which are factors which are generally seen within the sphere of macroeconomics as important in and of themselves. In the context of this analysis, however, they are important only insofar as they affect consumers' command over goods. The manner in which goods are produced, the person who produced them, and the location of production, are not important to an individual's welfare.

Utility can neither be measured nor compared across individuals.[8] It is nonetheless possible to devise a measure that permits one to evaluate the extent to which a policy change affects individuals. The measures of welfare change generally used, and those used in this paper, Hicksian equivalent variations (HEVs) report the amount of income individuals would be willing to pay (receive), in order to prevent (forgo) the implementation of a particular policy change.[9] These HEVs constitute the model's agents' subjective evaluation of the cost of a policy change with due consideration having been given to *all* effects: primary, secondary, tertiary, etc.

In heuristic terms, individuals are asked how much the proposed policy change is worth to them. They evaluate all the pros and cons of the proposed policy change and indicate to what extent the policy would make them better (worse) off. The HEVs reported in the paper are these evaluations, assuming that individuals knew all the implications of the proposed change and answered the question honestly.

3 Model Description

As a general rule, the particular CGE model used will depend upon the nature of the problem to be examined. In particular, it is important that the structure of the model be such that the policy changes whose effects are to be examined can be well represented, and that the behaviour of agents, firms and consumers within the model be sufficiently well represented that the most important expected reactions are adequately modelled.[1]

The policy changes to be investigated involve fundamental changes in the way that government services are provided in Canada. They involve changes in the system of federal and provincial transfers, taxes, and expenditures. To successfully model all of these policy changes requires a model which identifies provincial and federal taxes, as well as the residents of different Canadian regions and which is able to trace the effects of changes in regional incomes and tax structures on interprovincial trade. The most fully articulated model of the Canadian regional economy which includes detailed information on both provincial and federal taxes is Professor John Whalley's regional model developed for the 1984 Macdonald Commission. The model was made available to the Council by the Department of Finance,[2] with the consent of Professor Whalley.

The Whalley model has been discussed in detail in a number of contexts. Perhaps the most complete model description, from a heuristic point of view, is Whalley and Trela [1986], while Jones and Whalley [1989] provides the most technical detail. Here we describe the major features of the model without entering into a technical discussion. Readers interested in more detail are encouraged to consult the original model descriptions.

Production

The model provides a relatively detailed description of economic activity within Canada and of Canada's relations with the rest of the world (ROW). Six Canadian regions are identified: Atlantic Canada, Quebec, Ontario, Manitoba and Saskatchewan, Alberta and British Columbia and the Territories,[3] as well as an external sector proxying for the rest of the world. Each region, and the rest of the world, produce six commodities: an agricultural good, a heavy manufactured good, a light manufactured good, a resource good, services, and a public administration good. These forty-two (i.e., six goods times seven productive regions), are assumed to be qualitatively different so that each region both imports and exports each of the six goods to and from the other regions.

The assumption of qualitative difference between regional products (known as the Armington [1969] assumption) is necessary to account for the large interregional flows of same commodity trade (cross-hauling) observed in Canada. Cross-hauling is not possible under the alternative small country assumption and interregional trade must be modelled on a net basis, thereby ignoring some 80 per cent of interregional trade volumes.[4] Given that the impact which region-specific shocks might have in other regions is of central concern, it would be an error to assume away cross-hauling which is an important indication of the interconnectedness of regional economies. There is, nevertheless, reason to believe that the terms-of-trade effects observed under the Armington assumption may be undesirable.[5]

Consumption

Within the model there exist eight sources of final demand: the rest of the world (ROW), the federal government and each of the six regions. Each demand agent has its own distinct utility function (identified during calibration), an initial endowment of capital, labour and resources, whose services it sells at market prices in order to finance purchases of consumption goods. The exception to this rule is the federal government which has an endowment of capital and derives income by taxation. Production involves the combination of intermediate inputs, such as goods and services with primary factors (i.e., capital, labour and energy). As a result each of the 42 industries has an intermediate demand for the output of all 42 industries and the primary factors.

The modelling of government demand is in some respects unfortunate as it treats the federal and provincial governments in an asymmetric manner. The federal government is modelled as having its own separate preference or utility function. Provincial governments' demand, however, is not differentiated from the demand of a province's residents. Within the model, therefore, an increase in regional government income and an increase in the income of a region's

residents will provoke precisely the same response. In the real world, however, the bundle of goods purchased by a government differs significantly from that purchased by individuals. As a result, when federal expenditures on goods and services are transferred to the regional level, the new demand will be more oriented towards consumer goods than it would have been if the provincial government's demand were directly modelled. Insofar as the marginal propensity of consumers to purchase extraregional goods is higher than the government's, this will lead to an attenuation of regional welfare effects in the simulations.

Functional Form

Whalley uses nested CES functions to represent both preferences and the technology of production. The nested CES preference function can be thought of as a decision tree[6] where agents (either producers or consumers) make successive decisions about the share of total income which they will spend on different commodity groups. In the Whalley model, consumers and producers choose initially between expenditures on energy goods and non-energy goods. Having determined how much of their income they will spend on non-energy goods, they determine how much of this income to allocate between each of the five remaining commodity categories. Having made this choice, they decide between imported goods and domestically produced goods within each commodity group. They then choose between goods produced within their own region and goods produced in all other domestic regions, and finally they choose among goods produced within each of the other five regions. At each level, decisions are based upon relative prices (aggregate prices at the higher levels), and individual preferences. Each level has associated with it its own elasticity of substitution.

Tastes and intermediate production are modelled in this way in order to permit the sensitivity of demand to vary between domestically produced substitutes (such as, Canadian sources of light manufactured goods and foreign produced light manufacturing goods), and similarly, to make a distinction between extra and interregionally produced goods. This permits a region to face high export elasticities while at the same time having low import elasticities. This specification of tastes and production technology is sufficient to generate all interregional trade, all intermediate as well as final demands for goods, as well as the demand for factors of production and their allocation among competing uses.

Elasticities

The importance of the elasticities imposed on a CGE model cannot be overstated. Elasticities determine the responsiveness of actors to changes in prices. High elasticities mean that technology and tastes are flexible and imply that it is relatively easy to substitute one good for another in production or consumption. A relatively flexible economic structure can adapt to changes in the external economic environment more readily than a less flexible structure and, as a result, the degree of real economic displacement will be reduced. An inflexible structure (low elasticities) is less well able to reallocate goods and factors and will, therefore, transmit more directly the effects of any given shock.

Some elasticities which are required for the identification of preferences and technology are more or less well known. Others, due to a lack of data or problems with estimation technique, are less well-established. In order to illustrate the sensitivity of the simulations to elasticity assumptions, the four scenarios were run under a number of elasticity assumptions and the results are reported as a range. The values employed in these simulations are reported in Table 3-1. The starting point for these elasticities is the values used by Whalley and Trela [1986] in their work for the Macdonald Commission, as well as in more recent work by Jones and Whalley [1988, 1989, 1990]. Appendix B reports in some detail the results of the sensitivity analysis.

Table 3-1

Elasticity values used in model simulations

Demand side	
Elasticity of substitution between energy and nonenergy goods	0.5
Elasticity of substitution between nonenergy goods and regional public services	1.0
Rest of the world's elasticity of substitution between Canadian-produced goods and their domestic goods	3.0
Canadian elasticity of substitution between imported and domestically produced goods	1.3
Elasticity of substitution between imported and domestic oil	3.0
Elasticity of substitution between domestic goods produced in-house and out-of-province	1.3-2.6
Elasticity of substitution between goods coming from other provinces	3.0-6.0
Supply	
Elasticity of substitution between capital and labour	0.5
Elasticity of substitution between labour and resources	0.8
Elasticity of interregional labour mobility	0.05-0.25

Mobility Factor

It is assumed that capital is internationally and inter-regionally mobile and that, unless otherwise specified, all firms employ constant returns to scale technology. In the sensitivity analysis of Appendix B, this assumption is relaxed to allow increasing returns to scale in manufacturing. Labour is assumed to be imperfectly mobile between regions.

The model allows for labour mobility by assuming that there exists a range of individuals within every region with greater and lesser attachments to their native soil. Thus, given a particular change in policy which reduces welfare in a region, those with the least attachment to the region will leave first. They will be followed by the next least-attached individual and so on, until such time as the utility lost by the individual next in line to migrate is just equal to the utility he would gain were he to move. In the reported tables, labour elasticities are varied between 0.05 and 0.25.

Because individuals are mobile, the definition of regions is somewhat muddied. Within the model, preshock residents of a given region are assumed to share the utility function of a representative agent. When individuals move it is assumed that they retain the preferences of their region of origin. For the purposes of reporting changes in regional welfare, any utility gain or loss experienced by movers are attributed to the region in which they resided before the shock. An alternative set of assumptions would have movers' preferences change and their welfare loss/gain attributed to their new region. Whalley and Trela [1986, 74-77] provide a more complete discussion of the issues provoked by the assumption of imperfect labour mobility.

4 Initial Conditions

Fiscal Structure

In addition to consumption and production, the model contains a comprehensive description of the taxation system of both the federal and provincial governments, and the fiscal arrangements which exist between them and the inhabitants of different regions. At both the federal and regional levels of government there exist six types of tax: taxes on final demand, on intermediate demand, on individual income, on labour, on capital, and subsidies (which are modelled as a negative tax). For each tax type there exist several rates (there are 1,764 [42 goods in 42 separate uses] separate federal tax rates on intermediate demand, depending upon the commodity group and its point of manufacture). The attribution of actual taxes to each of these categories follows the principles developed by Statistics Canada [Siddiqui and Murty 1984] and is described in more detail in St-Hilaire [1990]. Federal transfers to individuals and to regional governments are separately identified in the model, although they are functionally identical as no distinction is made between the demand of regions' residents and the demand of the regional government. In addition, the federal government's demand for goods and services is fully identified.

Government Budget Constraint

Given the static nature of the model, government debt exists only as a liability upon which interest payments are made. It is assumed that the debt is distributed among agents in proportion to their share in federal interest payments as reported in the Provincial Economic Accounts (PEA).[1] In all simulations it is assumed that the current budgetary balance of all governments is maintained, which is to say that any increase/decrease in expenditure is met with an equal increase/decrease in tax revenue.[2]

Calibration to the Tastes and Technology of 1984

The importance of the data set used to calibrate a CGE model should be clear from the general discussion at the beginning of this section. Without an equilibrium data set, a CGE model is just an empty shell devoid of empirical content. The process of calibration determines the preferences of actors and the range of technologies available for all subsequent simulations. Given the static nature of the model, it is critical that both the preferences and technology embodied in the model be as up-to-date as possible.

The data set used by Whalley and Trela [1986] and by Jones and Whalley [1988,1989,1990], embodies 1979 technology with a demand and tax structure updated to 1981. The data set used in this paper embodies 1984 technology and preferences with the fiscal structure updated to 1988. The 1984 equilibrium data set was developed by France St-Hilaire [1990], who was also responsible for Whalley's 1979-81 data set. The updated data was made available to the Council by the Department of Finance, which originally commissioned its creation.

The equilibrium data set created by St-Hilaire is based on the 1984 provincial input-output tables (PIO) and Provincial Economic Accounts (PEA). The PIO are employed in order to ensure that the most accurate and detailed representation of tax structure, factor utilization, interindustry and interregional demand and supply are incorporated into the model. These data are crucial to ensure the appropriate identification of tastes and technology. As part of the process of data set construction, the PIO data are reconciled to the 1984 PEA which provides a uniform accounting framework. In the updating process described below, the 1984 PIO structure is further adjusted to reflect the fiscal structure of the 1988 PEA, with some additional data gleaned from *The System of Government Financial Management Statistics* (FMS) [Statistics Canada 1984,1986].

1988 Tax and Transfer Structure

In addition to ensuring that the taste and technology to which the model is calibrated is the most representative of the current trends, it is critical to ensure that the fiscal and tax structure within the model is as accurate a reflection of the current fiscal structure as possible. Over the last few years, a number of changes have occurred in the system of fiscal federalism making the system which existed in 1984 very different from the one which exists now. Among the changes are: phase one and two of tax reform, the GST, the FTA, and a number of spending caps which have had the effect of reducing the relative size of the federal

government and reducing the size of its transfers (both to regional governments and to individuals).

In order to ensure that the fiscal structure in the equilibrium data set reflects as closely as possible the present fiscal structure, the tax and transfer "rates" in the 1984 data set must be updated. The most recent published data on government spending and revenues comes from the 1988 PEA; this also predates a number of the recent tax and transfer reforms but does, nonetheless, bring the tax structure in the model closer to that observed presently.

The levels of tax flows represented by the collections in the PEA for any given year reflect both the tax rates and the level of activity observed in that year. As a result, the tax rate implied by a given revenue in 1988 would, if applied to the 1984 economy, produce a different level of revenue. Because of real growth in the economy, this would be true even if the 1988 revenue were to be expressed in constant 1984 dollars. In order to ensure that the fiscal structure in the model is the same as in 1988, the tax rates and the level of transfers in the model must be adjusted so that the effective rate of tax (transfer) in each major category is the same in the model as in 1988.

For each of these tax/transfer categories (i) in each region (j) the effective rate (ER_{ij}) for each year can be calculated as the ratio of tax revenue (transfer) divided by an indicator of regional activity for each year.[3]

$$ER_{ij84} = \frac{X_{ij84}}{Y_{j84}}$$

$$ER_{ij88} = \frac{X_{ij88}}{Y_{j88}} \qquad (4-1)$$

Rearranging these identities, one can solve for X^*_{ij} the level of transfer/tax in region j in assuming the fiscal structure of 1988 but the level of activity of 1984.

$$X_{ij84} = ER_{ij84} \times Y_{j84}$$

$$X_{ij88} = ER_{ij88} \times Y_{j88}$$

$$X^*_{ij84} = ER_{ij88} \times Y_{j84} \qquad (4-2)$$

One final adjustment is necessary before the fiscal structure of the model can be updated. Taxes appear in the model not as sums of money collected but as rates which are imposed on activity which results in revenues. To update the structure in the model, the tax rates in the model must be multiplied by the ratio of the 1988 to 1984 effective tax rates from the PEA.

$$X^*_{ij84} = ER_{ij88} \times Y_{j84}$$

$$X^*_{ij84} = ER_{ij84} \times Y_{j84} \times \frac{ER_{ij88}}{ER_{ij84}} \qquad (4-3)$$

The second aspect of the updating problem revolves around the fact that the number of tax categories in the model RT_{ijk} (which is determined by the tax information available in the PIO) exceeds the categories of taxes in the PEA. Each rate is, however, a member of one of the aggregate categories (i) found in the PEA. Each model rate (k) is adjusted, therefore, by the appropriate aggregate effective rate. The updating procedure, although unable to adjust the distribution of taxes within PEA categories, does capture the changes in structure observed at the PEA level of aggregation.

$$X^*_{ijk84} = RT_{ijk84} \times Y_{j84} \times \frac{ER_{ij88}}{ER_{ij84}} \qquad (4-4)$$

The updated tax rate RT^*_{ijk84} can be defined as:

$$RT^*_{ijk84} \equiv \frac{X^*_{ijk}}{Y_{j84}} \qquad (4-5)$$

Substituting the previous expression for X^*_{ijk84}, the model tax rate corrected for the fiscal structure of 1988 is equal to the 1984 rate times the ratio of the 1988 and 1984 effective rates.

$$RT^*_{ijk84} = \frac{RT_{ijk84} \times Y_{j84} \times \frac{ER_{ij88}}{ER_{ij84}}}{Y_{j84}}$$

$$RT^*_{ijk84} = RT_{ijk84} \times \frac{ER_{ij88}}{ER_{ij84}} \qquad (4-6)$$

In the model, distinction is made between direct taxes (other than income tax), indirect taxes, income taxes, taxes on capital and taxes on labour. The model also distinguishes between subsidies (transfers to business), transfers to persons, equalization and other transfers to government. The model makes a distinction between commodity taxes on final demand and commodity taxes on intermediate demand,

the rates being determined using information from the 1984 provincial input-output tables. The PEA contains similar tax and transfer categories, but makes no distinction between commodity taxes on indirect as opposed to final demand. As a result, the ratio of effective tax rates for the direct and indirect taxes (less income tax) is used to proxy for both final and intermediate commodity taxes.

Table 4-1 records the adjustment factors calculated as the ratio of effective tax (transfer) rates in 1988, 1984. Values greater than 100 imply tax or transfer rates higher in 1988 than in 1984, while values below 100 imply reduced effective rates. The table indicates the federal government's increased reliance upon commodity taxes in 1988, as compared to 1984, and substantially lower levels of subsidy in all but the agricultural sectors. Similarly lower transfers to the "have" regions and the increased tax share of the provinces are reflected in the ratios.

The PEA data accounts for most federal/provincial transfers. One exception, however, is the special Quebec abatement for the Canada Assistance Plan (CAP) and Established Program Financing (EPF). The Quebec abatement is a special tax provision whereby Quebec receives part of its CAP and EPF transfers in the form of ceded income tax points. Under this agreement, the federal government cedes to Quebec 13.5 tax points.[4] The revenue forgone by the federal government, which the Quebec government receives in the form of higher income tax receipts is, therefore, an implicit transfer to Quebec associated with CAP and EPF.

In order to ensure that this implicit transfer to Quebec is incorporated into the analysis, the abatement is assumed to be cancelled in all scenarios. This implies a reduction of Quebec provincial income tax rates by an amount sufficient to generate the implicit transfer, and an increase of federal income tax rates by the same amount. Federal transfers to the government of Quebec are assumed to increase by $1.34 billion,[5] less the amount in reduced transfers implied by the program reductions associated with each modelled scenario.[6]

Having calculated the change in the fiscal structure between 1984 and 1988, the model was simulated using the 1988 structure. The resulting equilibrium solution was used as both a starting point and as the basis for comparison in the simulations.

Simulations

As stressed in the introduction, the scope of the analysis presented in this paper is limited. Changes in the patterns

Table 4-1

Size of 1988 fiscal category, expressed as a percentage of 1984 category

	Atlantic Canada	Quebec	Ontario	Manitoba/ Saskatchewan	Alberta	British Columbia and Territories
			(Per cent)			
Federal						
Income taxes	72.8	70.1	69.2	82.2	92.8	74.8
Commodity taxes	123.2	125.2	125.2	119.2	105.4	116.9
Factor taxes	76.4	105.4	80.6	71.6	49.9	80.4
Subsidies	44.1	22.0	77.3	132.0	37.7	67.7
Transfers to persons	80.4	81.0	92.6	107.5	130.0	84.5
Government	95.9	73.9	85.8	121.1	128.0	103.3
Equalization	98.6	74.0	...	180.0	...	...
Abatement	...	75.5	...	...	...	...
Regional						
Income taxes	100.4	98.7	103.8	112.9	123.1	88.5
Commodity taxes	107.4	107.9	117.1	134.2	103.8	116.2
Factor taxes	98.6	100.9	108.0	103.1	106.4	83.2
Subsidies	88.2	89.0	99.2	120.5	82.3	134.6

Source: Calculations by author, based on Provincial Economic Accounts (PEA).

of federal and provincial expenditure and revenues examined constitute only a subset of the changes being considered. Many of these other factors are difficult to measure objectively.

The details of the policy changes imposed are provided with the presentation of results. It is nonetheless useful to describe the precise manner in which these policy changes are introduced. In the symmetric scenarios, the change in federal government spending implied by the assumed policy changes is calculated and deducted for each major category of expenditure: goods and services, transfers to persons, transfers to provincial and local governments, equalization payments. In the scenarios where there remains a system of equalization, a proportion of the total reduction in transfers to persons and to regional governments is redistributed among those regions already receiving equalization in proportion to their preshock share in all equalization payments.

In each confederation scenario, it is assumed that the regional governments attempt to maintain the program spending of the status quo. Thus, a withdrawal of federal spending in the UI system would be met by an increase in program spending by each provincial government in an amount equal to the reduction in federal expenditures in their region. In order for governments to meet their new obligations, taxes must also be adjusted (federal rates reduced and provincial rates increased). In order that governments' reactions be modelled in a neutral and consistent manner across all scenarios, it is assumed that each government within the model raises (lowers) all existing tax rates by an amount just sufficient to maintain the existing budget balance at preshock levels of activity. At preshock levels of activity, the increase (decrease) in revenues will be just equal to the changes in program responsibility.[7] The one departure from this procedure is in the sovereignty/association scenario, where the reduction in federal expenditures in Quebec exceeds tax revenues from that province. In this case, the excess of saved federal expenditures over lost revenues is redistributed among the remaining regions as an increase in federal intergovernmental transfers.

This modelling strategy has two important implications. First, because federal tax rates are reduced on the basis of the reduction in national expenditures, residents of regions which receive proportionally more of the reduced expenditures than the national average will see their disposable incomes decline as regional governments increase taxes by more than the federal government reduces taxes. By the same logic, regions which receive less than the national average will see their disposable incomes increase. Secondly, because the new tax rates are calculated based on preshock activity levels, it is possible that actual revenues exceed or fall short of those required to precisely maintain preshock budget balances. In those cases, the government in question reduces/increases its program spending in line with the shortfall/surplus. This permits governments in "have not" provinces to reduce program spending somewhat, while governments in "have" provinces have the opportunity to expand services.[8]

One final anomaly concerns the treatment of the federal government's demand for Quebec's output in the asymmetric scenario of sovereignty/association. In this scenario, it is assumed that the federal government's final demand for the output of Quebec is reduced to zero. Given that the federal government's demand for goods, like that of any demand-side agent, is determined by prices and utility alone, enforcing this assumption requires that the federal government's utility function be altered. Final demand for the goods and services of Quebec is reduced to zero by changing the share coefficient for Quebec to zero at the fifth level of the decision tree, and spreading Quebec's share coefficient among the other regions (including the ROW) in accordance with their share in the remaining demand.

This is equivalent to assuming that the federal government ceases to derive any utility from final demand of goods produced in Quebec. This assumption may seem severe, it does not, however, necessarily imply that the federal government will no longer purchase goods produced in Quebec. Federal direct purchases of Quebec goods will cease, but the intermediate demand generated by federal final demand may well be met by goods produced in Quebec. Essentially, this corresponds to an assumption that the government of Canada implements a "buy Canada" policy, which excludes Quebec firms from acting as principal contractors in federal contracts. Initial contracts will be awarded to Canadian firms (final demand) who are then free to subcontract and purchase parts wherever they please.

At an intuitive level, under this configuration, if Quebec enjoys a true comparative advantage in the production of airplane parts, then the rest of Canada (ROC) general contractor will, assuming the right price, continue to purchase these parts in Quebec. If, however, the Quebec firms are not competitive and are awarded contracts in the status quo on the basis of the federal government's preference for Quebec goods per se, then they will cease to receive the demand for these goods. In practical terms, this modelling is much less severe than the implicit modelling in balance sheet exercises where the sum of all expenditures in Quebec are subtracted from the sum of all revenues to determine the loss to Quebec. Because of the extensive trade links between Ontario and Quebec, much of the lost final demand will be recouped in increased intermediate demand for goods from Quebec.

Interpretation of Results

In evaluating the importance of these impacts, it is important to bear in mind that the welfare losses (gains) should be viewed as permanent. Although the model is static, its structure does include most of the long-run elements of dynamism which occur in the wake of a policy change. Thus industrial structure does change, resources move to become employed in their best alternative use, there are increasing returns to scale in manufacturing and individuals are free to, and do migrate.

A second important factor to bear in mind is the magnitude of these effects as compared to those reported in other CGE studies of policy changes. The most recent policy changes which have been subjected to extensive CGE analysis are the Free Trade Agreement (FTA) and the Goods and Services Tax (GST). In the studies done for the FTA, the welfare gain for Canada was found to be approximately 2.2 per cent[9] when using assumptions similar to those employed here [Harris 1984, 1028], while for the GST, the regional impact on real output ranged from a low of 1.0 per cent of per capita GDP in Quebec, to a high of 2.5 per cent in the Prairies [Hamilton and Kuo, 1989].[10]

One final proviso is in order. During the FTA and GST debates, it was often heard that the impact of the proposed reform was equivalent to x years of growth. Such comparisons can be made without violating the meaning of the CGE model's results. In this context, however, the appropriate real world equivalent is not growth in real GDP but growth in real per capita GDP, a significantly smaller number. In the 1980s (1980-90), real GDP growth averaged 3.5 per cent but per capita real GDP growth was limited to 1.6 per cent. Therefore, a 3.5 per cent loss in welfare could be interpreted as equivalent to a permanent loss of more than two years of economic growth, not a single year.

5 Fiscal Federalism Scenarios

The decision to update the model's fiscal structure complicates somewhat the exposition of the scenarios. Within the model, data are stated in terms of 1984 dollars and are based on the 1984 level of economic activity. This means that there is no published data source (i.e., PEA or PIO) against which economic aggregates in the model can be directly compared. As described in the previous chapter, the model data is derived from these initial sources but because of the updating procedure, the values within the model represent what the PEA would look like were the tax and transfer structure, at that time, to have been the same as in 1988. Nonetheless, the starting point for all shocks is the published PEA and system of government financial management statistics (FMS) data for 1988. As a result, the explanation of the imposed policy *ex ante* changes will be stated in terms consistent with the 1988 PEA. Model results are stated in terms of 1984 model dollars and, where possible, in percentage terms.

Figure 5-1 records the various federal transfer and spending programs, as outlined in the PEA. The figure is divided into two distinct sections, the first horizontal axis of the first section represents the various symmetrical forms of fiscal federalism analysed in this paper, with confederation becoming increasingly decentralized as one moves to the right. Similarly, the horizontal axis of the second section represents movement towards increasing asymmetric decentralization. In both sections each federal program (as described in the PEA) has a horizontal bar associated with it. Each program's bar continues as long as the associated program remains in federal hands. Thus in the extensive decentralization scenario, equalization payments continue to be made whereas regional economic expansion has been stopped. The size of each program in the status quo (in millions of 1988 dollars) is indicated by a number at the end of each bar. In the second section, the bars are split into two, with the upper section representing federal expenditures in the rest of Canada and the lower bar representing federal expenditures in Quebec. The diagram indicates quite clearly the progressive decentralization implied by the modelled scenarios. Table 5-1 indicates federal expenditures broken down by category and region in the status quo.

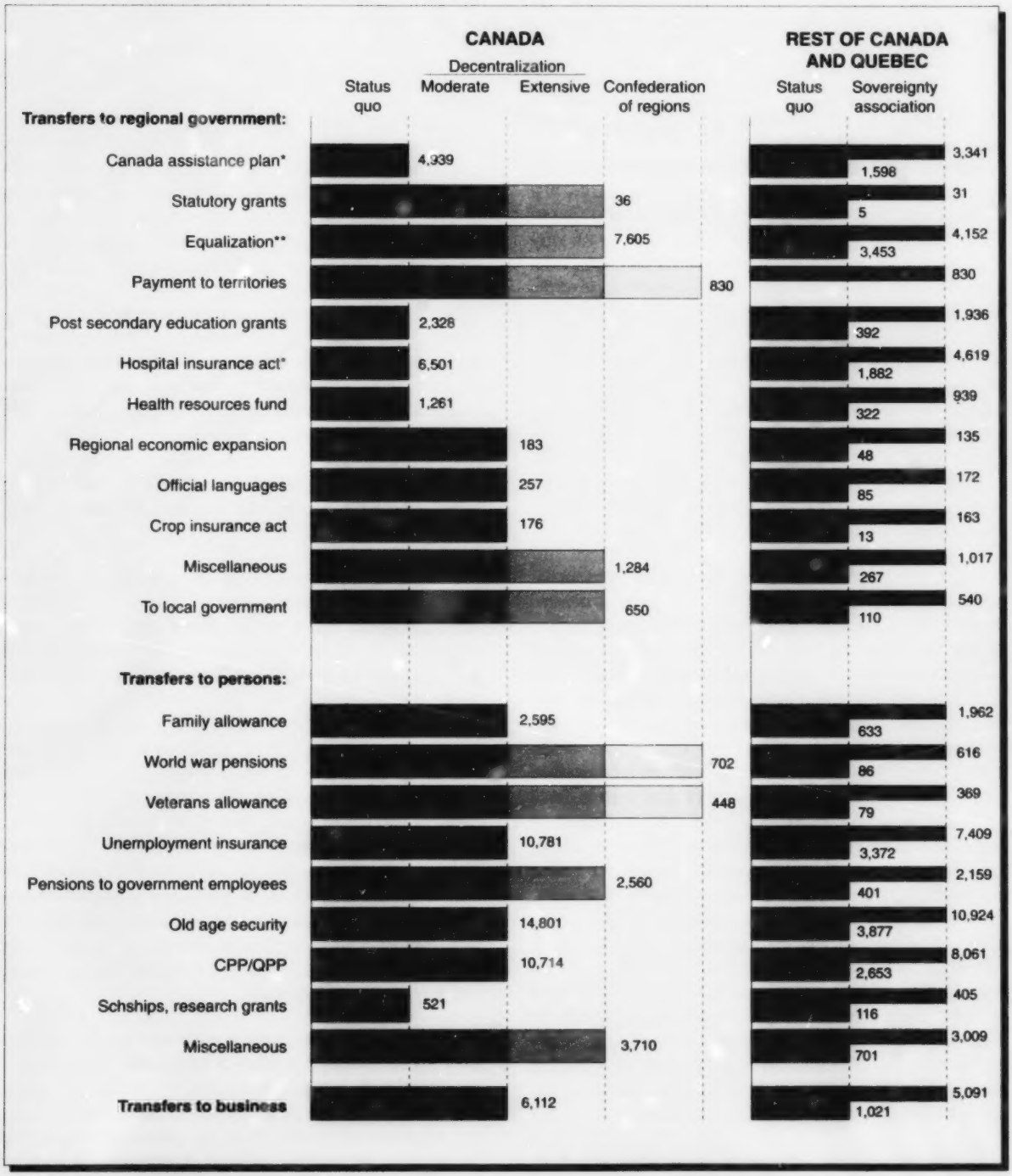
The shocks applied to the model differ somewhat from those implied by the data in Figure 5-1. Two additional factors must be considered: 1) the response of the equalization system to the changes in transfers; and 2) the reaction of government expenditures on goods and services, as the size of the civil service and the direct component of certain programs is reduced. The increase in equalization, as other transfers are reduced, is explained by the fact that the formula by which equalization payments are determined is designed to compensate provinces whose tax base is inferior to a weighted average of the "have" provinces. The "have not" provinces tend to receive relatively more in non-equalization transfers than do other provinces. As a result, the kind of decentralization envisioned here tends to reduce the tax base disproportionately, which results in a formula-based increase in equalization. Past experience indicates that a $1 decrease in the overall level of federal transfers occasions a 10¢ increase in overall equalization payments. This rule of thumb is used to increase equalization in those scenarios where the equalization program is assumed to be maintained.[1]

The second important factor revolves around reduced federal expenditures on goods and services as various programs are eliminated. If the federal government is no longer responsible for the unemployment insurance system, it need no longer employ workers to administer it, nor need it continue to purchase the pens, paper, computers and office space used by these workers. Although the PEA identify transfers by program, they do not do so for federal expenditures on goods and services. Working from PEA data alone, it is not possible to determine the relationship between specific programs and federal spending on goods and services. The FMS, however, outlines federal government spending by program. Figures in the FMS include both transfers and expenditures on goods and services. For any given program, therefore, a comparison of total expenditure from FMS with the transfer spending from the PEA is sufficient to derive an estimate of the expenditure of goods and services on a PEA basis.

This process is complicated somewhat by the fact that the PEA are based on a calendar year, while FMS is based on a fiscal year. As a result, the total of transfers and goods and service spending in the two systems is not the same. For the purposes of modelling, the additional simplifying assumption that the ratio of total expenditures in FMS to total expenditures in PEA is the same for both transfers and expenditures on goods and services is made. By virtue of

Figure 5-1

Federal policies under alternative fiscal scenarios



* Includes Quebec abatement
** Includes taxation agreements

Table 5-1

Federal current expenditures by region

	Atlantic Canada	Quebec	Ontario	Manitoba and Saskatchewan	Alberta	British Columbia and Territories
			(Millions of 1988 dollars)			
Transfers to:						
Business	468	1,345	1,814	2,299	1,452	413
Regional government	2,047	5,032*	5,538	1,682	2,004	3,158
Equalization	2,421	3,144	...	1,024	...	...
Persons**	5,606	11,958	15,365	4,238	3,541	6,260
Expenditures on goods and services	3,620	4,736	9,449	1,880	1,703	2,632

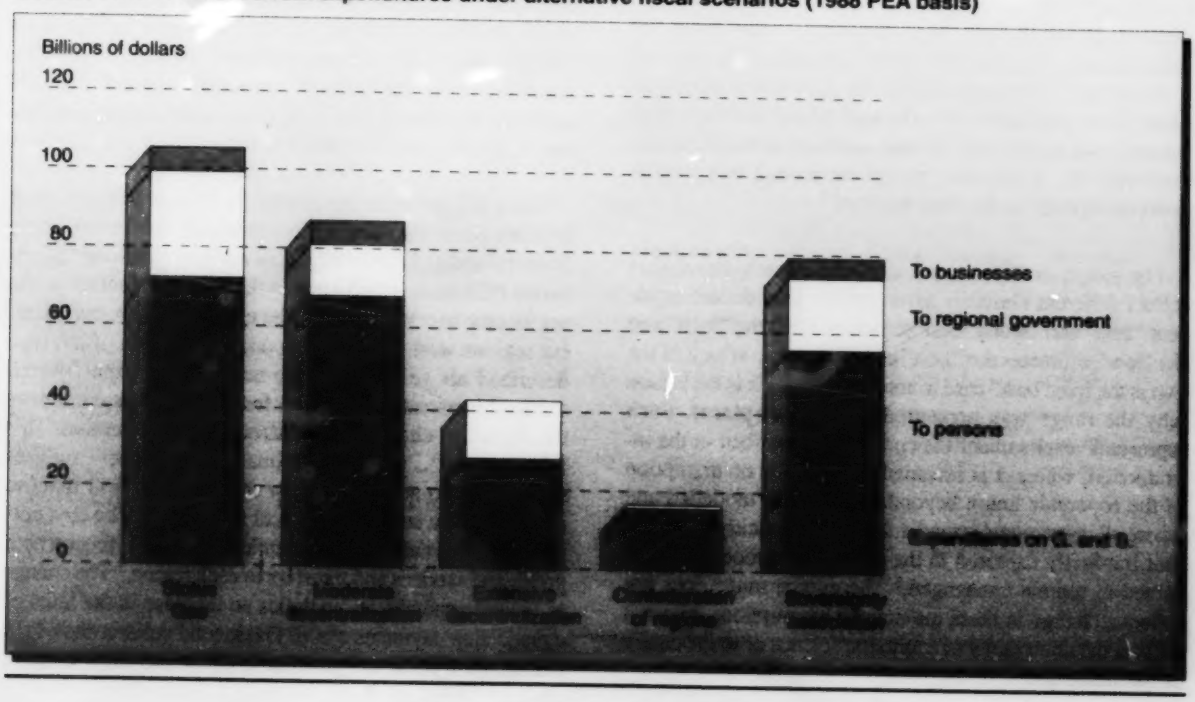
*Includes implicit transfers ($1,344 million) associated with Quebec abatement.
**Includes CPP, QPP payments.
SOURCE Calculations by author, based on Provincial Economic Accounts (PEA).

this single assumption it is possible to derive estimates of the goods and services spending associated with particular transfer programs.[2]

Figure 5-2 illustrates the changes to the total size, as well as the composition, of federal expenditures in each of the scenarios. The reduction in the size of the federal government

Figure 5-2

Ex ante levels federal current expenditures under alternative fiscal scenarios (1988 PEA basis)



implied by each scenario is clear. In the first scenario, most of the reduction comes in the form of reduced intergovernmental transfers. In the second, this is complemented by reduced personal transfers. In each case the equalization component of intergovernmental transfers increases. In the first scenario, the increase is masked by the reduction in other intergovernmental transfers. In the third scenario, transfers are reduced to nearly nothing, with what remains of intergovernmental transfers reflecting transfers to the territorial governments of the Yukon and the Northwest Territories. The final scenario indicates the change in federal expenditures were Quebec to sever all ties with the federal government.

In the discussion which follows, unless explicitly stated otherwise, all data come from the 1988 equilibrium data base. Reference is made to PEA numbers within the text but all numbers in the tables come from the model. The model data differs from the PEA because: 1) they are stated in 1984 constant dollars; 2) the tax and transfer data has been adjusted to compensate for economic growth that occurred between 1984 and 1988; and 3) because the postshock data reflect both the initial modelled change as well as reactions to it.

In the welfare tables two sets of results are reported. The "low estimate" comes from the simulation undertaken in the sensitivity analysis reported in Appendix B, whose assumptions yielded the smallest total absolute regional welfare deviation. The "high estimate" comes from the simulations whose assumptions produce the greatest absolute welfare change. Except for the welfare tables, all cited figures are taken from the high labour mobility, high interregional supply and demand elasticity simulations (see Appendix B). In all cases, except the second, this simulation corresponds to the "low estimate".

The range of estimates provided for each simulation reflect different elasticity assumptions: they do not represent "best" and "worst" case scenarios. Both the "high" and the "low" estimates are "best" case scenarios. Which of the two is the true "best" case is not certain (which is the reason why the range was presented in the first place). Each represents results under the conditions described in the introduction, where it is assumed that there is no disruption of the economic union beyond that directly modelled and where all institutional arrangements, not explicitly modelled (but implicitly captured in the calibration process) are assumed to remain unchanged.[3] The quoted range does not reflect a change in these maintained assumptions, rather it reflects the uncertainty of economic science as to the nature of the status quo.[4]

Moderate Decentralization

The first modelled scenario concentrates reform in the area of intergovernmental transfers. The federal government is assumed to cease to play a role in the following areas: health care, post-secondary education, welfare and training. All federal tax rates are reduced in proportion to the reduction in expenditures. Regional (provincial) rates are increased by an amount sufficient to generate (at preshock levels of activity) increased revenues equal to the reduction within region federal spending on both transfers and goods and services. In this way, provinces are modelled as attempting to maintain the same level of services as previously provided by the federal government. Regions which pay fewer federal taxes than average or which receive more than average levels of program spending may experience significant increases in net tax rates.

On a PEA basis, the cuts from federal spending amount to $18.5 billion (17 per cent) of federal expenditures, 81 per cent of which is in the form of reduced transfers to provincial governments and 19 per cent in the form of reduced spending on goods and services associated with the transferred programs.

Changes in taxes, transfers and program expenditures such as these will impact different regions differently. The most important direct impact will be a net reduction (increase) in regional income for those regions which receive relatively more (less) in federal expenditures and pay relatively less (more) in federal taxes. Those who receive more and pay less will lose regional income as the positive contribution of the federal government to the regional economy is reduced. Similarly those who are net contributors to fiscal federalism will benefit.

Table 5-2 presents the postshock change in the federal balance sheet for each region. Because the values come from the updated model they bear no simple relation to published PEA data. The figures in the balance sheet show the net income loss which would be experienced by the different regions were there to be a decentralization of the type described above. It takes into account the impact which changed incomes will have on federal revenues, as well as the impact of changes in the structure of production. This balance sheet is unlike traditional balance sheet exercises which take no account of how the economy will react to changes in the structure of fiscal federalism. The first column indicates the total reduction in federal spending on both goods and services and transfers in each region.[5] The change in federal expenditures includes an increase in the level of equalization payments made. The second column shows the change in federal tax revenues, while the third column

Table 5-2

Moderate decentralization balance sheet

	Change in federal government		
	Expenditures	Tax revenue	Balance
	(Billions of 1984 dollars)		
Atlantic Canada	–1.4	–0.9	–0.4
Quebec	–2.5	–2.5	0.0
Ontario	–5.3	–6.5	1.2
Manitoba and Saskatchewan	–1.2	–1.1	–0.1
Alberta	–1.9	–2.0	0.1
British Columbia and Territories	–2.6	–1.9	–0.7
Total	–14.9	–15.0	0.1

Source Simulation using Regional Computable General Equilibrium Model (RCGE).

indicates the change in each region's balance sheet with the federal government. Thus, Atlantic Canada lost $0.4 billion more in federal expenditures and transfers than it received in the form of reduced federal taxes. The revocation of the Quebec abatement is reflected in the relatively small reduction in federal taxes collected in Quebec.[6]

Although interesting in and of itself, the balance sheet exercise (even when presented under simulation) does not tell the whole story. The change in residents' welfare depends not just upon the net change in taxation levels, it also depends upon changes in residents' incomes due to changes in regional wages, in the pattern of interregional demand, in the structure of production and the distribution of factors, all of which will affect their ability to purchase goods produced in other regions. The model can speak to these issues as well.

Table 5-3 shows the change in interregional patterns of demand and the changes in the terms of trade for each of the seven producing regions. The two effects are intimately related, the changes in the pattern of regional demand (quantity of goods traded) reflects a number of simultaneous influences. Increased (decreased) domestic (intraregional) demand deriving from increased (decreased) disposable income and changes in the tax structure will tend to raise domestic prices relative to extraregional prices (change in the terms of trade) and reduce (increase) the level of interregional trade. By the same token, an increase (decrease) in a region's trading partners' disposable income will tend to increase external demand for a region's goods.

Looking at Table 5-3, Atlantic Canada, in response to a significant decrease in its disposable income, reduces demand for goods produced in Quebec by 3.1 per cent. Similarly, Atlantic Canada's demand for goods (both final and intermediate) produced in Ontario falls by 2.1 per cent. Quebec's and Ontario's demand for goods in Atlantic

Table 5-3

Moderate decentralization percentage change in interregional trade

	Supply						
Demand	Atlantic	Quebec	Ontario	Manitoba and Saskatchewan	Alberta	British Columbia and Territories	Change in terms of trade
				(Per cent)			
Atlantic	...	–3.1	–2.1	–0.8	–1.6	–0.6	–0.19
Quebec	2.3	...	–0.5	–0.7	2.1	1.1	–0.25
Ontario	0.9	2.6	...	–0.7	2.0	3.3	–0.04
Manitoba and Saskatchewan	2.6	0.6	–1.7	...	–0.3	1.5	0.48
Alberta	–0.2	3.9	–0.6	–1.5	...	3.4	–0.01
British Columbia and Territories	0.6	–0.5	–1.7	–2.7	–0.2	...	0.11
Federal government	–14.2	–20.5	–18.5	–17.6	–21.9	–16.4	...
ROW	–1.1	1.2	–0.0	–2.9	–0.4	–1.2	–0.02

Source Simulation using RCGE.

Canada are up (2.3 and 0.9 per cent) reflecting both lower prices in Atlantic Canada and the increase in disposable income experienced in Ontario. Prices from one region to the next fluctuate for a number of reasons, including changes in tax rates and changes in the level of demand.

The transfer of spending power from the federal government to the provinces implies higher "provincial" demand and one would expect higher interprovincial trade. It would appear that this demand is relatively evenly spread out among sources of supply, although British Columbia and Atlantic Canada find more of their produce being exported than do others. This likely reflects the relatively large income losses observed in these regions and the associated deterioration in the terms of trade.

As stressed, the welfare of individuals is affected only if the changes made impact on their ability to consume. The manner by which they are enabled to consume is of no importance. For example, an increase in exports is welfare enhancing only if it implies an increased command over goods. If exports increase but domestic consumption remains unchanged or reduced, as might occur in the face of a decline in the terms of trade, then the increased exports are welfare reducing.[7]

Table 5-4 presents the "high" and "low" estimates of regional welfare gain/loss from the sensitivity analysis. These welfare measures take into account all factors which impinge upon individuals' ability to consume. In the table, the change in welfare of the federal government, which is modelled as a separate utility maximizing agent, is shared among the residents of different regions in proportion to their share in national GNP.[8]

Looking at Table 5-4, Atlantic Canada, British Columbia, and the Territories show the largest welfare losses in this scenario, while Ontario enjoys the largest gain. Manitoba and Saskatchewan are more or less unaffected by the proposed decentralization. Quebec and Alberta endure a relatively small impact in the "low estimate." The impact in the "high" estimate is significantly negative for Quebec and significantly positive for Alberta. Although the direction of these effects could be anticipated from the balance sheet exercise in Table 5-2, the magnitude of changes does illustrate how changes in the structure of demand, production and the distribution of factors affects the results.

Comparing the "low" and "high" estimates in Table 5-4, it is clear that although there is variation in the magnitude of results, depending upon the assumptions imposed, the extent of that variation is limited. Welfare changes, both in terms of direction and magnitude, remain robust to different assumptions as to labour mobility, returns to scale and interregional supply and demand substitutability.

Table 5-4

Moderate decentralization, regional welfare effects, percentage change in regional GNP

	Low estimate	High estimate
	(Per cent)	
Atlantic Canada	–1.48	–1.78
Quebec	–0.07	–0.61
Ontario	1.26	1.31
Manitoba and Saskatchewan	–0.85	–0.03
Alberta	–0.26	0.56
British Columbia and Territories	–2.04	–2.40
ROW	0.00	0.00
Canada (total)	–0.04	–0.02

Source Simulation using RCGE.

Extensive Decentralization

In addition to all aspects of the moderate decentralization scenario, the extensive decentralization scenario envisions the federal government passing on responsibility for regional economic expansion, official languages, crop insurance, as well as various personal transfer programs, such as, family allowance, unemployment insurance and old age security. As before, provinces are modelled as attempting to maintain the same level of services as previously provided by the federal government and the federal government is assumed to continue to provide equalization payments to "have not" provinces.

On a PEA basis (see Figure 5-1), the cuts from federal spending amount to an additional $39.01 billion (36 per cent of original federal expenditures), 96 per cent of the additional reduction is in the form of reduced transfers and 4 per cent takes the form of reduced spending on goods and services. Table 5-5 presents the regional balance sheet for this scenario. In terms of their relations with the federal government, Atlantic Canada and the western provinces are considerably worse off under extensive decentralization. The extent of their loss and the size of Quebec's gain is influenced by the overall increase in equalization in this scenario of $4.3 billion.[9] The greatest net loss is sustained by Manitoba and Saskatchewan who lose the agricultural

Table 5-5

Extensive decentralization balance sheet

	Change in federal government		
	Expenditures	Tax revenue	Balance
	(Billions of 1984 dollars)		
Atlantic Canada	–3.0	–2.2	–0.8
Quebec	–6.8	–7.6	0.8
Ontario	–13.6	–17.2	3.6
Manitoba and Saskatchewan	–3.1	–1.2	–1.9
Alberta	–5.0	–4.8	–0.2
British Columbia and Territories	–5.7	–4.8	–0.8
Total	–37.2	–38.0	0.8

Source Simulation using RCGE.

subsidies which have become so important over the last decade. Most of this loss would be concentrated in Saskatchewan which receives the majority (60 per cent) of the subsidies and is the smaller economy.

Table 5-6 shows the observed changes in the pattern of interregional trade and terms of trade. As would be expected, the increase in flows is higher here than under moderate decentralization. Terms-of-trade effects remain small except in Manitoba/Saskatchewan where increased prices, due to substantially higher taxes, translates into reduced exports. The impact of the abandonment of federal subsidies is not experienced in an industry specific manner as they are replaced by *equivalent* provincial subsidies. As modelled, the transfer of subsidies from the federal to the regional governments implies a reduction in federal revenue requirements and an equivalent increase in the required level of provincial governments' revenues. For provinces which receive relatively more in subsidies than they pay in taxes, the impact will be felt as a reduction in disposable income. As might be expected given the size of income loss, western demand for the goods of other regions is considerably reduced. Ontario and Quebec, whose federal taxes fall by less than their share of reduced federal expenditures, demand more from other regions.

Table 5-7 shows the regional welfare impact of extensive decentralization. As noted, the principal explanation for the welfare changes is the income effects implied by changes to the federal-provincial balance sheet. These initial effects are, however, amplified under simulation as high tax rates in provinces which gain on the balance sheet improve their lot even further relative to the losing regions which must increase provincial taxes, thus increasing tax-based distortions and contributing to the fragmentation of the economic union.

Atlantic Canada and the western provinces lose while Ontario and Quebec gain. The loss in both the East and the West is mitigated by the response of the equalization

Table 5-6

Extensive decentralization, percentage change in interregional trade

	Supply						
Demand	Atlantic	Quebec	Ontario	Manitoba and Saskatchewan	Alberta	British Columbia	Change in terms of trade
				(Per cent)			
Atlantic	...	–4.7	–4.6	–5.9	–2.7	–1.8	–0.40
Quebec	4.7	...	2.0	–4.3	5.6	8.0	–0.59
Ontario	4.4	5.2	...	–3.4	4.8	5.7	–0.25
Manitoba and Saskatchewan	7.1	–5.6	–12.5	...	–8.5	–6.1	1.48
Alberta	7.9	7.0	–5.8	–1.2	...	3.4	–0.05
British Columbia and Territories	9.8	–3.0	–2.3	–7.6	–0.4	...	0.18
Federal government	–18.9	–31.0	–26.0	–21.3	–34.3	–23.8	...
ROW	–1.5	3.1	0.8	–9.0	1.2	–2.0	0.10

Source Simulation using RCGE.

Table 5-7

Extensive decentralization, regional welfare effects, percentage change in regional GNP

	Low estimate	High estimate
	(Per cent)	
Atlantic Canada	–4.04	–4.45
Quebec	0.86	1.05
Ontario	3.12	3.84
Manitoba and Saskatchewan	–6.91	–7.74
Alberta	–1.35	–1.56
British Columbia and Territories	–2.78	–3.06
ROW	0.01	0.03
Canada (total)	–0.12	0.01

Source Simulation using RCGE.

system which increases payments to the Atlantic region by $1.5 billion and to the prairie region by $0.7 billion. Quebec also gains from a $1.9 billion increase in equalization. In the absence of increases in equalization, Atlantic Canada's loss would rise to 6.65 per cent, Quebec's gain would be reduced to 0.3 per cent, and the Prairie provinces' loss would increase to 7.96 per cent (for more detail see Appendix B).

The big losers, especially compared to the moderate decentralized option, are the grain producing provinces. The principle reason for the change in their fortunes is the loss of federal funds associated with agricultural subsidies. It could be argued that this loss, unlike those associated with a program such as the family allowance system, should be seen as temporary. The subsidies which the western provinces received in 1988 were a specific response to a specific distortion in the world economy (worldwide agricultural protectionism). To the extent that the subsidies do correct exactly for the price distortions caused by artificially low world prices, the welfare loss associated with the removal of subsidies would disappear once world prices are restored to their free-market level.

The first column of Table 5-8 reports the welfare impact of decentralized federalism, exclusive of the impact of agricultural subsidies using the assumptions of the "low estimate". The second column reproduces the "low estimate" of Table 5-7. Clearly the scenario where agricultural subsidies are not eliminated (the first column) improves considerably the position of the prairie provinces. Other regions are less well off because the tax savings made available to them are reduced.[10]

Which scenario more closely reflects the long-run costs of extensive decentralization is not immediately clear. Risk sharing is a very real aspect of federalism as we know it. In the present world context, the western provinces are benefiting through heavy subsidization of agriculture. Not long ago, the eastern provinces benefited from a similar program (the NEP) which subsidized energy consumption. Whalley ran simulations which indicated that removal of the NEP in 1981 would have had serious long-run impacts on eastern provinces.[11] As almost every vestige of this program has since been eliminated, a similar calculation would now produce a near zero impact. What is important, insofar as federalism is concerned, is not the magnitude of the loss to the western provinces at this point in time or to Eastern Canada in the early 1980s, but rather that decentralization would rob Canadians of their ability to share risks in this way, which would, at some time or another, impact on all regions in a negative manner.

Concentrating on Table 5-7, the difference between high and low estimates is somewhat larger than in the moderate decentralization scenario. This reflects the extensive decentralization scenario's greater sensitivity to the assumptions with respect to increasing returns to scale in manufacturing and interregional substitutability in demand and

Table 5-8

Extensive decentralization, regional welfare effects, percentage change in regional GNP – comparison of results with and without agricultural subsidies

	Agricultural subsidies not cancelled	Agricultural subsidies cancelled
	(Per cent)	
Atlantic Canada	–4.55	–4.04
Quebec	0.56	0.86
Ontario	2.63	3.12
Manitoba and Saskatchewan	–4.28	–6.91
Alberta	–0.73	–1.35
British Columbia and Territories	–3.14	–2.78
ROW	0.01	0.01
Canada (total)	–0.13	–0.12

Source Simulation using RCGE.

supply. Although the range of results is higher in this as opposed to the previous scenario, the direction of results is the same in both the low and high estimate case and the magnitude of the changes is, more or less, the same.

Confederation of Regions

The confederation of regions scenario envisions the quasi disappearance of the federal government. In this scenario, the federal government exists purely as a superstructure providing limited services to largely independent regional governments. It incorporates all of the features of the two previous scenarios, as well as the elimination of equalization payments and federal programs concerning aborigines, culture, and amateur sport. These changes imply an additional reduction in federal transfer spending of $15.85 billion and a reduction in spending on goods and services of $5.69 billion. The major difference between this and the extensive decentralization scenario is the elimination of the federal program of equalization payments.

Looking at Table 5-9, it is clear that the largest burden is placed on the Atlantic provinces, and the two prairie provinces, Saskatchewan and Manitoba. Quebec, also a recipient of equalization in 1988, experiences a net-income loss, albeit smaller than that of the eastern and western provinces. Ontario and Alberta receive significant tax breaks while British Columbia and the Territories emerge relatively untouched.

Table 5-9

Confederation of regions balance sheet

	Change in federal government		
	Expenditures	Tax revenue	Balance
	(Billions of 1984 dollars)		
Atlantic Canada	–9.3	–3.7	–5.6
Quebec	–14.3	–13.8	–0.5
Ontario	–20.0	–29.6	9.7
Manitoba and Saskatchewan	–6.8	–2.9	–3.8
Alberta	–6.7	–8.6	1.9
British Columbia and Territories	–8.0	–8.0	0.0
Total	–65.0	–65.8	0.8

Source: Simulation using RCGE.

Given the magnitude of the income losses in the Atlantic and prairie regions, it is not surprising to find substantial trade impacts. Atlantic Canada's demand for goods falls by between 13 and 18 per cent (see Table 5-10), while Manitoba and Saskatchewan's demand falls by almost equivalent amounts. The drop in Atlantic Canada's terms of trade is reflected in large increases in the quantity of

Table 5-10

Confederation of regions, percentage change in interregional trade

	Supply						
Demand	Atlantic	Quebec	Ontario	Manitoba and Saskatchewan	Alberta	British Columbia and Territories	Change in terms of trade
				(Per cent)			
Atlantic	...	–16.8	–18.4	–16.5	–13.1	–15.9	–3.48
Quebec	28.5	...	1.3	–0.6	4.6	1.9	–1.37
Ontario	43.7	14.3	...	5.6	8.8	9.8	–0.82
Manitoba and Saskatchewan	65.4	–9.5	–17.0	...	–12.1	–17.8	0.88
Alberta	143.4	19.8	–5.1	18.4	...	7.3	0.51
British Columbia and Territories	135.1	10.4	2.1	25.5	2.6	...	0.20
Federal government	–46.7	–66.5	–64.1	–58.5	–69.2	–63.02	...
ROW	17.5	8.1	3.6	–5.0	1.3	–1.6	1.31

Source: Simulation using RCGE.

goods exported. The very large percentage increases in certain western provinces' demand for the produce of Atlantic Canada reflects the relative paucity of trade between these regions in the reference year. In a similar manner, the West experiences increased exports of its produce. In the case of Atlantic Canada, the income loss and associated reduced domestic demand is reflected in reduced terms of trade. The same effect in the western provinces is offset more or less completely by the loss of agricultural subsidies.

As before, the welfare impacts of the hypothesized change in fiscal federalism (Table 5-11), reflect the balance sheet calculations of Table 5-9. Here too, however, the gains and losses experienced by regions differ significantly from those predicted by the balance sheet. This is especially true for Quebec which has close trading ties with Atlantic Canada (each is each other's second largest Canadian trading partner after Ontario). Interestingly, Quebec's welfare loss seems to be the most sensitive to the assumptions made as to elasticities. This derives from the relative importance of Atlantic Canada in Quebec's economic relations. In the low mobility, low interregional trade elasticity (High Estimate) scenario, the 27 per cent welfare loss in Atlantic Canada makes itself felt even more in Quebec than in the high flexibility scenario (Low Estimate). The greater assumed flexibility of the Low Estimate scenario means that Quebec can more easily turn to other sources of demand, thus reducing the secondary impact of Atlantic Canada's loss. The relative dramatic drop in equalized provinces' welfare, as we move from the extensive decentralization scenario, reflects, in part, the mitigating impact which increased equalization had in that scenario. As before, a substantial portion of the western provinces' welfare loss is explained by the loss of agricultural subsidies.

Sovereignty/Association

The final scenario investigated is asymmetric insofar as only Quebec's relations with the federal government are assumed to change. In this scenario, it is assumed that all fiscal ties between Canada and Quebec are broken. All federal taxes in Quebec are set to zero and all federal transfers and expenditures in Quebec are set to zero. It is assumed that Quebec and Canada maintain a customs union such that there are no customs or excise charges on goods traded between Quebec and the rest of Canada, and that the tariffs and duties charged by Quebec to the rest of the world are the same as those charged by Canada. As is the case in all scenarios, the realignment is assumed to take place in an atmosphere of calm with no disruptions in the economic union, institutions or regulations governing interregional trade, other than those explicitly mentioned.

Table 5-11

Confederation of regions, regional welfare effects, percentage change in regional GNP

	Low estimate	High estimate
	(Per cent)	
Atlantic Canada	−22.70	−27.45
Quebec	−1.96	−3.26
Ontario	7.94	9.41
Manitoba and Saskatchewan	−14.31	−15.24
Alberta	0.77	1.59
British Columbia and Territories	0.66	0.71
ROW	0.03	0.02
Canada (total)	−0.35	−0.42

Source Simulation using RCGE.

Table 5-12 presents the balance sheet for this scenario. Because the sum of federal expenditures on goods and services and transfers to the government of Quebec or residents of Quebec exceeds taxes collected in Quebec, the federal government receives a net benefit of $4.38 billion under sovereignty/association. It has been assumed that preshock excess of federal saving is distributed among the remaining provinces as increased intergovernmental transfers according to each region's share in preshock transfers.

Table 5-12

Sovereignty/association balance sheet

	Change in federal government		
	Expenditures	Tax revenue	Balance
	(Billions of 1984 dollars)		
Atlantic Canada	0.2	0.0	0.1
Quebec	−16.1	−11.7	−4.4
Ontario	2.5	0.7	1.9
Manitoba and Saskatchewan	0.2	0.0	0.2
Alberta	0.8	0.2	0.6
British Columbia and Territories	0.7	0.2	0.5
Total	−11.7	−10.5	−1.2

Source Simulation using RCGE.

Table 5-13

Sovereignty/association, percentage change in interregional trade

Demand	Supply: Atlantic	Quebec	Ontario	Manitoba and Saskatchewan	Alberta	British Columbia and Territories	Change in terms of trade
				(Per cent)			
Atlantic	...	10.7	−1.4	−1.5	−1.0	−1.9	0.29
Quebec	1.2	...	−0.8	−0.1	−0.4	0.1	−2.03
Ontario	−0.8	12.0	...	−1.9	−1.4	−1.9	0.25
Manitoba and Saskatchewan	0.8	12.1	−0.2	...	−1.6	−1.0	0.36
Alberta	2.2	16.6	0.5	−0.6	...	−1.5	0.44
British Columbia and Territories	2.0	16.0	−0.4	−0.9	−0.3	...	0.33
Federal government	−2.8	−100.0	−3.5	−4.3	−3.4	−4.2	...
ROW	0.1	12.4	−0.9	−0.9	−1.1	−1.6	0.56

Source Simulation using RCGE.

The complete withdrawal of the federal government from activity in Quebec contributes to an important deterioration in Quebec's terms of trade (Table 5-13). Lower prices for Quebec products are met by increased demand (between 10 and 16 per cent). Quebec's income loss is reflected in reduced demand for the produce of other regions.

The welfare impact of sovereignty/association is particularly sensitive to elasticity assumptions (see Table 5-14). For regions other than Quebec, the long-run effect of Quebec's withdrawal from the federal government is more or less neutral. For Quebec, sovereignty/association implies a loss which under assumptions of relatively easy substitutability of goods and services is equal to −1.4 per cent of Quebec's GNP. Under more constraining assumptions the loss is as high as 3.5 per cent of Quebec's GNP.

Table 5-14

Sovereignty/association, regional welfare effects, percentage change in regional GNP

	Low estimate	High estimate
	(Per cent)	
Atlantic Canada	0.36	0.17
Quebec	−1.42	−3.52
Ontario	−0.07	0.41
Manitoba and Saskatchewan	−0.09	−0.10
Alberta	−0.22	0.43
British Columbia and Territories	−0.12	−0.30
ROW	−0.02	−0.04
Canada (total)	−0.35	−0.58

Source Simulation using RCGE.

6 Summary and Discussion

The analysis in this paper has been conducted upon the basis of several important maintained assumptions: perfect competition, the Armington assumption, capital mobility, elasticities *inter alia*. Perhaps the most important assumption made is that the modelled changes will occur within a peaceful and relatively harmonious political context. In many respects this assumption is forced upon the researcher by the nature of CGE models. Within the context of the model, increased levels of acrimony would be tantamount to changes in tastes and technology. In order to model such changes, certain arbitrary assumptions as to the extent of the change and its particular nature would have to be made. These could be implemented either by means of tariff equivalents or by altering parameters in utility or production functions. Neither of these options is very appealing. Results based on simulations where such changes were to be imposed would be no more reliable than the guestimates made as to changes in behaviour. Given the existing range of opinion as to the extent of potential disharmony which might exist following reconfederation, the harmonious result was chosen as a benchmark for the impacts of the changes in fiscal federalism.

A disharmonious process, where nonfiscal arrangements such as interregional barriers to trade and a changed willingness of regions to substitute one source of supply for another would alter the results. The extent to which actual results will differ from this benchmark will depend on the extent of the disharmony and the influence of factors other than fiscal federalism. In the face of a serious disruption of the economic union, the costs reported here could be substantially higher in the long run, while the short-run costs might well be enormous.

Similar concerns argue against explicitly modelling the impact of various institutional arrangements which form part of the relations of the federal and provincial governments. Procurement policies, marketing boards, interprovincial barriers to trade and the flow of capital all influence the economics of confederation in one way or another. They are not, however, susceptible to a satisfactory CGE modelling.

The fact that the present analysis has had to abstract away from a number of institutional and socio-political aspects of reconfederation does not mean that these influences would not play a role in any significant reorganization. In fact, some subjective or objective evaluation of these factors must be added on to these results before any analysis of the economic aspects of reconfederation can be considered complete. The following does not pretend to be such an analysis. It does, however, serve to enumerate some of the issues not explicitly addressed in this paper, as well as hinting at their relative importance.

Among the most important of these unaddressed facets of reconfederation are issues surrounding the division of federal assets and liabilities in the confederation of regions and sovereignty/association scenarios. The federal debt, the liability implicit in the federally funded Old Age Security and Canada/Quebec Pension Plans, the issue of Crown lands and Crown corporations, are all contentious and involve multi-billions of dollars. The potential impact of the transfer of these assets could greatly enhance the losses reported in this study. For example, the assumption of perfect capital mobility in the model forces us to assume that there is no risk premium associated with provincially held debt when in fact there is a substantial premium. In the present analysis in the sovereignty/association scenario, it is assumed that the interest rate on debt would remain unchanged when a portion of the debt is transferred to Quebec. In reality, Quebec even now pays a premium on its debt because of a greater perceived risk in financial markets. Were one to assume that Quebec would pay this existing risk premium on the new debt, then the additional debt servicing charges implied by the premium would increase Quebec's loss in this scenario by between 0.7 and 1.1 per cent of GNP.[1] Similar additional costs would be borne in the confederation of regions scenario for all provinces except Ontario. The losses would be even higher if additional risk premiums were to be required because of the higher debt ratios or greater perceived political risk.

A further consideration is the fact that the model implicitly assumes constant returns to scale in the provision of government services. Assuming the existence of Public Goods[2] or the existence of economies of scale in the provision of government services, the model tends to understate the costs of decentralization. By the same token, however, if there exist diseconomies of scale caused by duplication of provincial and federal functions then the costs of deconfederation will be over stated. It is far from clear

which economy dominates in the federal system, although it is difficult to deny that substantial economies of scale do exist in some areas.

Also at issue will be the various international accords to which Canada is signatory. It is not at all clear that a decentralized Canada, or a separate Quebec, would be able to negotiate or maintain on the same terms such agreements as the Free Trade Agreement, the Auto Pact, or the Multi-Fibre Agreement. Similarly, a substantial decentralization will likely lead to an abrogation of a number of internal agreements, including the commodity marketing boards and special transportation subsidies provided to grain producers. The costs to any given region associated with losing these agreements could be substantial. In the case of the Free Trade Agreement, national losses have been estimated to be as high as 6 per cent [Harris 1984], while the cost to Quebec of losing the market share guaranteed to it under the Milk Marketing Board has been estimated as high as 0.1 per cent of GNP in the long run [Grady 1991].[3]

No doubt there exist other issues which might come to bear in the wake of any eventual reorganization: such things as the impact of a greater social cohesion, the benefits of a more rational north-south trade flow, come to mind. Like those issues mentioned above, the present analysis does not deal with these issues.

7 Conclusion

The analysis presented in this paper shows quite clearly that there are economic costs associated with all of the options considered. The costs which have been identified are only a subset of the economic costs and may not be the most important economic considerations. They must, therefore, be weighed against other economic costs and benefits, as well as any political gains and losses associated with the various options.

The present analysis is suggestive of the extent to which risksharing and an economic and monetary union are an essential component of the status quo economic union. The dismantling of this system (implicit in the decentralization scenarios) would not be neutral in its effects across regions: some regions would benefit, others would lose. Two of the modelled scenarios (extensive decentralization and confederation of regions), appear to impose such heavy costs on some regions as to be impractical. In the absence of a dramatically augmented equalization system, it is doubtful that these regions could maintain current levels of public services in the face of a large-scale decentralization. Only Ontario and British Columbia would benefit from a large-scale decentralization. The extent of their improvement pales compared to the welfare losses in other regions. Nor is it clear that the particular distribution of the benefits from confederation are permanent. Whalley's work suggests that in the not-too-distant past the flow of benefits was very much in the favour of the central provinces of Ontario and Quebec. By the same token, when the current spate of agricultural protectionism runs its course, the level of benefits currently running into the prairie provinces will be greatly reduced.

Despite our focus on the regional gains and losses deriving from alternative fiscal arrangements, there is another important qualitative result which emerges from this research. It concerns the nature of the Canadian economic union, its functioning and the risk sharing by which it is characterized. Canada and its regions are interrelated and interconnected economically, institutionally, and politically. The economic linkages between different regions are exemplified by spillover effects from interregional trade and factor mobility which ensures that the impact of a region-specific shock is felt not just in the region directly affected but in all of the regions. These economic linkages are reinforced by an institutional system of interpersonal and interregional risk sharing, embodied in such federal programs as Medicare, post-secondary education, the Canada Assistance Plan, unemployment insurance, social assistance and government pensions. Yet other economic linkages take the form of various ad hoc and political programs such as, marketing boards, agricultural subsidies, the national energy plan, crop insurance, freight subsidies and other industrial policies, which come and go as the country evolves and external economic conditions change.

The benefits flowing from federal programs are not static and they are not unidirectional. The analysis in this paper has been concentrated largely on the second category of linkages. In 1988, there are clear beneficiaries from the system but as we noted, in 1981 the flow of benefits was very different. The net beneficiaries from other components of the economic union are less clear. Independent of their present size or direction, it remains true that any large-scale decentralization or fragmentation poses the risk that the country lose its ability to share risks and good fortune in the manner that it has done over the last 125 years.

Finally, it should be emphasized that the results presented in this paper do not constitute a final word. Rather they are intended to provide a benchmark from which the many unquantifiable aspects of reconfederation can be evaluated. In the case of certain scenarios (moderate decentralization and perhaps sovereignty/association), they suggest that it is not ultimately on the basis of regions' fiscal relations with the federal government that decisions will be made. Contrarily, in the case of extensive decentralization and confederation of regions, the costs outlined above are sufficiently large as to suggest that the regional impact of fiscal federalism should play a large role in the final calculus of the division of powers.

Appendices

A FMS, PEA Reconciliation

The changes in government expenditures on goods and services were calculated by comparing the reduction in federal spending as programs were eliminated, as per the Financial Management System (FMS) accounts which lists federal expenditures by program. The spending figures in the FMS include both spending on goods and services and transfers but do not break out the proportion of each in program spending. The PEA, on the other hand, have a total value for federal spending on goods and services and an itemized breakdown of transfers. By comparing the change in total expenditures from the FMS with the change in transfers from the PEA, it is possible to isolate the goods and services component of specific programs. This comparison is complicated somewhat by the fact that the PEA are recorded on an annual basis while the FMS are recorded on a fiscal year basis. Thus the total of government expenditures, transfers and goods and services, is not the same in each set of accounts. The simplifying assumption is made, therefore, that the ratio of total expenditure in FMS and PEA was the same as the ratio of transfers in these two accounts.

Mathematically, let XGS_{PEAi} represent expenditures on goods and services associated with program "i", as per the PEA and similarly let XGS_{FMSi} represent the same figure in the FMS. Similarly let TR_{PEAi} and TR_{FMSi} indicate transfers in the PEA and FMS respectively and TX_{PEAi}, TX_{FMSi} represent total expenditures in the two accounts. Total government expenditures under each system can be expressed as an identity where the overscore indicates the values which are known.

$$\overline{TX_{FMAi}} \equiv TR_{FMAi} + XGS_{FMAi}$$

$$TX_{PEAi} \equiv \overline{TR_{PEAi}} + XGS_{PEAi} \qquad \text{(A-1)}$$

Assuming that the ratio of total expenditures in the two systems is the same as the ratio of expenditures and transfers which we express as a constant β, then the change in each expenditure category can be expressed as a simple function of expenditures in the same category under the other accounting system.

$$\beta = \frac{\sum TR_{FMSi}}{\sum TR_{PEAi}} \equiv \frac{\overline{\sum TX_{FMSi}}}{\sum TX_{PEAi}} \qquad \text{(A-2)}$$

By making use of these relations and rearranging the original identity, one can express the change in expenditures on goods and services associated with any one program entirely in terms of β, TR_{PEA}, and TX_{FMS}, all of which are known.

$$XGS_{PEAi} = TX_{PEAi} - \overline{TR_{PEAi}}$$

$$TX_{PEAi} = \frac{1}{\beta}\,\overline{TX_{FMSi}}$$

$$\Delta XGS_{PEAi} = \frac{1}{\beta}\,\Delta\overline{TX_{FMSi}} - \Delta\overline{TR_{PEAi}} \qquad \text{(A-3)}$$

B Sensitivity Analysis

The following tables illustrate the sensitivity of results to variations in specific assumptions. Each table presents the range of results derived as one of the three critical assumptions described below was varied from its lowest to highest values. The assumptions which are being held constant in each case are noted in the footnote accompanying each table. Table 3-1 in the main text gives the values used for the elasticities which were held constant across all simulations.

Interregional Elasticities of Demand and Supply

Among the elasticities in the model for which there exists little or no empirical evidence are those which determine the ease with which goods produced in one Canadian region are substitutable for goods produced in another region. The lack of time series data on interregional trade means that there exist no estimates of these elasticities in the literature. In the base line calculations, following Hazeldine [1979] and Whalley and Trela [1986], it is assumed that these elasticities are the same as those for the international sector.

Economic theory would suggest, however, that given the relative smallness and openness of the regional economies, regional elasticities of demand and supply would be higher. In an effort to judge the impact which higher elasticities might have upon the estimated welfare impacts, a series of simulations assuming higher sensitivities were run. Table B-1 displays the range of results for the five simulations modelled when interregional elasticities are varied from the international levels to values twice as high.

As one might expect, the higher elasticities imply more flexible production processes and, as a result, the extent of loss/gain from any given shock is reduced. Thus the column of results for the higher elasticity scenario produces values closer to zero although, by and large, quite close to those which follow from the base line assumptions. The fact that the variation is not large suggests that the principal effect illustrated by the simulations is the impact of changes in the nature of federalism.

Table B-1

Sensitivity to assumed elasticities of interregional substitution in demand and supply

	Change in welfare	
	Low elasticities	High elasticities
	(Per cent of regional GNP)	
Moderate decentralization		
Atlantic Canada	–1.50	–1.48
Quebec	–0.11	–0.07
Ontario	1.31	1.26
Manitoba and Saskatchewan	–0.82	–0.85
Alberta	–0.27	–0.26
British Columbia and Territories	–2.04	–2.04
Extensive decentralization		
Atlantic Canada	–4.04	–3.89
Quebec	0.86	1.00
Ontario	3.12	3.03
Manitoba and Saskatchewan	–6.91	–7.17
Alberta	–1.35	–1.31
British Columbia and Territories	–2.78	–2.76
Confederation of regions		
Atlantic Canada	–27.45	–22.70
Quebec	–3.26	–1.96
Ontario	9.41	7.94
Manitoba and Saskatchewan	–15.24	–14.31
Alberta	1.59	0.77
British Columbia and Territories	0.71	0.66
Sovereignty/association		
Atlantic Canada	–0.34	0.36
Quebec	–1.85	–1.42
Ontario	0.15	–0.07
Manitoba and Saskatchewan	–1.01	–0.09
Alberta	–0.63	–0.22
British Columbia and Territories	0.31	–0.12

NOTE Labour mobility = 0.25.
Provinces maintain program spending.
Constant returns to scale.

Terms-of-Trade Effects

There are those who would argue that any regional demand elasticity less than infinity is too small. In the discussion of the Armington assumption in the body of the text, the incompatibility of the small country (or one price) assumption with the stylized facts of Canadian interregional trade is outlined. In particular, the one price-argument only seems to make sense when we are dealing with goods which are commodity-like – which is to say very good substitutes for one another. Goods like grain, refined gasoline, microcomputers, seem to fit into this category. The vast majority of trade, however, consists of goods which are in one sense or another distinct from each other. A car made in Ste. Thérèse (Quebec) is different from that made in Oshawa and they carry different prices. The rationale for separate prices becomes all the more evident if one considers the fact that, at the level of aggregation employed in the model, what is being traded is not individual goods but "the light manufactured output" of an entire region. The price of that output will be a weighted average of the prices of all its components. Even if these components were to remain constant, the aggregate price would fluctuate and differ from region to region as the mix of goods produced in each sector/region changed.

The sensitivity analysis presented above provides an indication of how model results change as regional demand is more or less sensitive to changes in the price of regional output. It does not, however, address the influence of the Armington assumption per se. Model structure precludes the complete abandonment of the Armington assumption. It is possible, nonetheless, to break out the extent to which the price changes observed have contributed to welfare loss. The technique presented in Damus et al. [1991] takes the change in the value of preshock exports, less the change in value of preshock imports, as a measure of the increased (decreased) consumption possibilities implied by the modelled shock. In their case, the shock was the imposition of a tax on capital and they interpreted the measure as a tax export effect.

In the context of this study, the same technique can be applied to approximate the extent to which the observed welfare loss is associated with the Terms-of-trade effect. It should be stressed that the difference between the total impact and the terms-of-trade portion does not constitute a measure of the results which would flow from a small country model. Such a model, where prices do not adjust, would yield much greater quantity adjustments than the Whalley model, and the return to imperfectly mobile factors would be more greatly affected.

The Damus et al. estimate of terms-of-trade gains (*ETOT*) is defined as:

$$ETOT = \sum X_i^1 P_i^1 \times \%\Delta P_i - \sum M_i^1 P_i^1 \times \%\Delta P_i \qquad \text{(B-1)}$$

Table B-2 shows the welfare results for the high interregional labour elasticities solution broken down into the full result and the terms-of-trade effect. The difference between the total welfare effect and the estimated terms-of-trade effect includes the redistributive impact (both implicit and explicit) of the changed fiscal structure, and any efficiency gains or losses endured.

Interregional Labour Mobility

A second area of uncertainty revolves around interprovincial labour mobility. Although economists have been concerned with interprovincial labour mobility for some time, there exist no firm estimates of the long-run sensitivity of workers to interprovincial differences in the standard of living. Although it is clear that individuals' personal attachment to the province of birth can be important, it is also clear that given a sufficiently large difference in economic opportunity, people can be induced to move from one province to another. Because the economics literature provides little guidance as to the values of interregional labour mobility, a number of simulations using elasticities which imply that a 1 per cent difference in income from one province to another will engender a 0.25 per cent reduction in population to an alternative assumption which implies that a 1 per cent income differential would engender only a 0.05 per cent change in population were run.[1] The effect which these alternative assumptions have on estimated welfare impacts can be seen in Table B-3.

It is clear from Table B-3 that the mobility assumption is more important to the magnitude of the results than were the interregional price elasticities. Under the low elasticity assumption, the impacts of changed federal policies is relatively high, while under the high elasticity scenarios the impact is considerably reduced.

Unlike the high interregional demand and supply elasticity scenarios, it is not immediately clear that the increased flexibility implied by higher labour mobility elasticities would contribute to reduced impacts to a given shock. It is true that welfare, as measured in the model, would be less affected. However, within the context of Canadian society and politics, it is not clear that the population losses implied by higher labour mobility would be considered acceptable. In the high mobility scenarios there is considerable

Table B-2

Decomposition of regional welfare change into terms-of-trade effect and non-terms-of-trade effect

	Change in welfare		
	Total impact	Terms of trade	Redistributive and efficiency impact
	(Per cent of regional GNP)		
Moderate decentralization			
Atlantic Canada	−1.48	−0.56	−0.92
Quebec	−0.07	−0.00	−0.07
Ontario	1.26	0.48	0.78
Manitoba and Saskatchewan	−0.85	0.06	−0.91
Alberta	−0.26	0.22	−0.48
British Columbia and Territories	−2.04	0.17	−2.21
Extensive decentralization			
Atlantic Canada	−3.89	−2.05	−1.84
Quebec	1.00	0.24	0.76
Ontario	3.03	1.85	1.18
Manitoba and Saskatchewan	−7.17	0.12	−7.29
Alberta	−1.31	1.00	−2.31
British Columbia and Territories	−2.76	0.52	−3.28
Confederation of regions			
Atlantic Canada	−22.70	−3.82	−18.88
Quebec	−1.96	−0.41	−1.55
Ontario	7.94	1.05	6.89
Manitoba and Saskatchewan	−14.31	−0.28	−14.03
Alberta	0.77	1.12	−0.35
British Columbia and Territories	0.66	0.40	0.26
Sovereignty/association			
Atlantic Canada	−0.36	0.59	−0.95
Quebec	−1.42	−1.46	0.04
Ontario	−0.07	0.52	−0.59
Manitoba and Saskatchewan	−0.09	0.21	−0.30
Alberta	−0.22	0.24	−0.46
British Columbia and Territories	0.12	0.29	−0.17

NOTE Labour mobility = 0.25.
Provinces maintain program spending.
Constant returns to scale.

population movement. In fact, looking at the confederation of regions scenario under high mobility assumptions, as much as 7 per cent of Atlantic Canada's population is predicted to leave the region. In the context of the model, this is a voluntary migration and should be of no concern. However within the context of the real world, Canadians tend to attach great importance to these kinds of population movements.

There are those who argue that labour mobility is lower in Quebec because of language. Table B-4 presents a series of scenarios which assume that the rest of Canada has labour mobilities of 0.25 while Quebec's mobility is much lower, 0.05. The effect of this alternative assumption is to increase Quebec's welfare loss in all scenarios while reducing its population loss. The impact is especially significant in the sovereignty/association scenario. The impact on the rest of Canada is smaller but also negative, suggesting that the reduced mobility in Quebec tends to reduce inefficiency throughout the country by altering the allocation of resources.

Manufacturing Returns to Scale

A final critical economic assumption revolves around the possibility of increasing returns to scale. During the

Table B-3

Sensitivity analysis, labour mobility varying from 0.05 to 0.25

	Change in welfare	
	Low elasticity	High elasticity
	(Per cent of regional GNP)	
Moderate decentralization		
Atlantic Canada	−1.94	−1.50
Quebec	0.03	−0.11
Ontario	1.07	1.31
Manitoba and Saskatchewan	−0.16	−0.82
Alberta	0.44	−0.27
British Columbia and Territories	−2.52	−2.04
Extensive decentralization		
Atlantic Canada	−4.64	−4.04
Quebec	1.33	0.86
Ontario	3.36	3.12
Manitoba and Saskatchewan	−7.26	−6.91
Alberta	−1.00	−1.35
British Columbia and Territories	−3.27	−2.78
Confederation of regions		
Atlantic Canada	−27.20	−23.96
Quebec	−3.51	−2.14
Ontario	9.32	8.28
Manitoba and Saskatchewan	−15.50	−14.24
Alberta	1.34	0.64
British Columbia and Territories	1.32	0.78
Sovereignty/association		
Atlantic Canada	0.17	−0.34
Quebec	−1.42	−1.85
Ontario	0.41	0.15
Manitoba and Saskatchewan	−0.10	−1.01
Alberta	0.43	−0.63
British Columbia and Territories	−0.30	−0.31

NOTE Low (international) interregional price elasticities.
Provinces maintain program spending.
Constant returns to scale.

Table B-4

Sensitivity analysis, Quebec low labour elasticity (0.05), ROC high labour elasticity (0.25)

	Change in welfare	
	Low elasticity	High elasticity
	(Per cent of regional GNP)	
Moderate decentralization		
Atlantic Canada	−1.69	−1.50
Quebec	−0.14	−0.11
Ontario	1.36	1.31
Manitoba and Saskatchewan	−0.81	−0.82
Alberta	−0.26	−0.27
British Columbia and Territories	−2.03	−2.04
Extensive decentralization		
Atlantic Canada	−4.23	−4.04
Quebec	0.87	0.86
Ontario	3.17	3.12
Manitoba and Saskatchewan	−6.93	−6.91
Alberta	−1.34	−1.35
British Columbia and Territories	−2.86	−2.78
Confederation of regions		
Atlantic Canada	−24.08	−23.96
Quebec	−2.86	−2.14
Ontario	8.70	8.28
Manitoba and Saskatchewan	−14.30	−14.24
Alberta	0.73	0.64
British Columbia and Territories	0.90	0.78
Sovereignty/association		
Atlantic Canada	0.17	−0.34
Quebec	−3.03	−1.85
Ontario	0.60	0.15
Manitoba and Saskatchewan	−0.89	−1.01
Alberta	−0.47	−0.63
British Columbia and Territories	−0.30	−0.31

NOTE Low (international) interregional price elasticities.
Provinces maintain program spending.
Constant returns to scale.

Canada-U.S. free-trade debate, much was made of the fact that manufacturing was characterized by increasing return to scale and that only by increasing the markets to which Canadian producers had access could the full productivity gains available to Canadian firms be exploited. Table B-5 reports the results for the simulations as the manufacturing returns to scale are varied from a low of 0 per cent to a high of 10 per cent.[2]

The effect of the increasing returns to scale assumption depends upon the region and scenario examined. For regions such as Quebec and Ontario whose industrial structure is

Table B-5

Sensitivity analysis, return to scale varied from 0 to 10 per cent

	Change in welfare	
	Constant returns to scale	10 per cent increasing returns
	(Per cent of regional GNP)	
Moderate decentralization		
Atlantic Canada	−1.94	−2.00
Quebec	0.03	0.55
Ontario	1.07	1.28
Manitoba and Saskatchewan	−0.16	−0.97
Alberta	0.44	−0.34
British Columbia and Territories	−2.52	−2.36
Extensive decentralization		
Atlantic Canada	−4.64	−4.41
Quebec	0.64	1.33
Ontario	3.36	3.79
Manitoba and Saskatchewan	−7.26	−8.03
Alberta	−1.00	−1.71
British Columbia and Territories	−3.27	−3.02
Confederation of regions		
Atlantic Canada	−27.20	−26.70
Quebec	−3.51	−2.54
Ontario	9.32	10.16
Manitoba and Saskatchewan	−15.50	−16.20
Alberta	1.34	0.81
British Columbia and Territories	1.32	1.63
Sovereignty/association		
Atlantic Canada	0.17	0.36
Quebec	−3.52	−1.42
Ontario	0.41	−0.07
Manitoba and Saskatchewan	−0.10	−0.09
Alberta	0.43	−0.22
British Columbia and Territories	0.30	−0.12

Note: Labour mobility = 0.05.
Provinces maintain program spending.
Low (international) interregional price elasticities.

relatively concentrated in the manufacturing sector, the assumption tends to amplify the effects of scenarios run under the constant returns to scale assumption. For areas which have small manufacturing sectors, the effect can be to improve conditions depending upon whether they benefit more from reduced prices in the manufacturing sectors than they lose in reduced demand for their own goods.

Equalization Rule

The equalization rule employed in the body of the paper assumes that a $1 cut in total transfers by the federal government will result in a 10¢ increase in equalization payments. The actual sensitivity of the equalization system depends upon a number of factors including: the existence of any expenditure caps and ceilings; the extent to which a given reduction in federal transfers has redistributive implications; the state of the cycle and the provincial revenue source used to calculate the payments. Discussions with the Department of Finance suggest that for incremental changes with little redistributive effects, a ratio of 7.5¢ on the dollar can be expected, assuming provinces use a combination of income and sales taxes to collect the lost revenues. For larger shocks with important redistributive implications, such as those we model here, the ratio can be significantly higher. The ratio of 10¢ to the dollar used in the paper constitutes a conservative estimate.

Table B-6 below illustrates the sensitivity of model results to the assumed degree of equalization sensitivity. Each column in the table reports model results for an increase in equalization payments equal to the percentage of reduced transfers indicated in the column title. All simulations are run under the maintained assumptions of high interregional substitution elasticities, high labour mobility and constant returns to scale. It is important to bear in mind that in all five sets of results the equalization system remains. What is being analysed is the increase in equalization in the face of a given reduction in federal transfers, not a reduction or abandonment of equalization per se.

It is clear from examining the rows in Table B-6 that the more sensitive the equalization system, the lower the losses of the equalized regions – Atlantic Canada, Quebec, and Manitoba and Saskatchewan. If we compare the moderate decentralization results with no increase in equalization and a 10 per cent increase, the dynamic component of the equalization system reduces Atlantic Canada's loss by about 1.4 percentage points, and reduces Quebec's and Manitoba and Saskatchewan's loss by about 0.4 percentage points. Regions which do not receive equalization are made worse off by a more generous equalization program as they pay for the transfers to other regions with higher taxes. For Ontario, British Columbia, and the Territories the loss in moving to a 0 per cent change in equalization to a change equal to 10 per cent of reduced transfers is 0.4 per cent points, while it is 0.2 per cent for Alberta. The equivalent

Table B-6

Sensitivity to equalization rule

	Equalization sensitivity				
	0 per cent	5 per cent	7.5 per cent	10 per cent	12.5 per cent
Moderate decentralization					
Atlantic Canada	–3.08	–2.28	–1.88	–1.48	–1.25
Quebec	–0.47	–0.27	–0.17	–0.07	0.02
Ontario	1.68	1.47	1.37	1.26	1.19
Manitoba and Saskatchewan	–1.23	–1.04	–0.94	–0.85	–0.75
Alberta	0.04	–0.11	–0.18	–0.26	–0.3
British Columbia and Territories	–1.68	–1.86	–1.95	–2.04	–2.12
Change in equalization	0.00	654.15	881.23	1,308.31	1,635.38
Extensive decentralization					
Atlantic Canada	–9.45	–6.65	–5.27	–3.89	–2.52
Quebec	–0.43	0.30	0.65	1.00	1.34
Ontario	4.58	3.80	3.40	3.03	2.65
Manitoba and Saskatchewan	–8.76	–7.96	–7.56	–7.17	–6.77
Alberta	–0.30	–0.81	–1.06	–1.31	–1.57
British Columbia and Territories	–1.56	–2.15	–2.45	–2.76	–3.06
Change in equalization	0.00	2,131.66	3,197.48	4,263.31	5,329.14

changes for the extensive decentralization case are approximately twice those of the moderate case.

It is clear that the dynamic component of the equalization system plays an important role in cushioning the impact of decentralization in Atlantic Canada. This cushioning comes, however, at the expense of those provinces which do not receive equalization, such as British Columbia and the Territories. In fact, as modelled, a sufficiently generous equalization system (see the 12.5 per cent column) would result in the net loss in an equalizing region (British Columbia and Territories) exceeding the loss in an equalized region (Atlantic Canada). This result highlights the principle weakness in the present modelling of equalization insofar as the distribution of payments is not sensitive to the redistributive impacts of policy changes.

Notes

Chapter 1

1 Scenarios have been designed so that they correspond to those modelled by Péloquin et al. [1992].

Chapter 2

1 Shoven and Whalley [1984] provide a more comprehensive overview of CGE models, their relation to microeconomic theory and the kinds of analysis for which they are suited.

2 Varian [1978] provides a standard exposition of these conditions.

3 Shoven and Whalley [1984] provide a simple numerical example.

4 Even if it were possible to accurately model the status quo impact of a program with a tariff equivalent, the fact that the tariff is reduced as economic activity falls whereas most of these non-tariff phenomenon are constant, makes the use of tariff equivalents even more tenuous.

5 Whalley and Trela [1986] also declined to use the CGE framework to analyse these programs, preferring to rely on partial equilibrium calculations.

6 The long run is defined as the amount of time required for the capital stock to completely adjust and for markets to find their new equilibrium.

7 There exists an emerging class of dynamic CGE models which permit both short- and long-run analysis of the types of problems looked at here. So far, application of these models have been limited to the international level. There are, however, no reasons why such an analysis could not be pursued at the regional level. The Council is, in fact, in the process of evaluating one such model [McKibbon and Sachs 1991].

8 Deaton and Muellbauer [1980, 184-89] provide a useful (if technical) description of alternative measures of consumer surplus and their suitability as measures of welfare.

9 As the name suggests, HEVs have their origin with the work of Sir John Hicks. Shoven and Whalley [1984] provide a more detailed description of this measure.

Chapter 3

1 Shoven and Whalley [1984] provide a number of examples of models and discuss the relationship between model detail and policy analysis.

2 In fact, the Department provided the Council with both the 1981 Whalley and some code modified to run with the St-Hilaire 1984 data set. The data set was provided in disaggregated form and the aggregation to a seven region, six commodity/industry framework was performed by the author.

3 The equilibrium data set lumps British Columbia, the Yukon and the Northwest Territories together. Unlike the other groupings, the principal rationale for this aggregation is the small size of the Territories rather than any inherent similarity between their economies and B.C.'s.

4 It follows that as the level of disaggregation employed falls, the less the importance of cross-hauling regional trade statistics. At the lowest level of aggregation available from Statistics Canada, cross-hauling still accounts for 60 per cent of interregional trade [Nightingale 1991].

5 For a discussion of the relative merits of the small country versus the Armington assumptions, as well as an indication of the relative importance of terms-of-trade effects, see Appendix B.

6 The analogy of a decision tree is imprecise as it implies that decisions made at higher levels are independent of decisions at lower levels. Insofar as higher-level decisions are made independently of the particular mix of lower-level decisions, this is true. To the extent, however, that upper-level decisions are made based upon the relative price of commodity aggregates and these price aggregates are sensitive to the mix of lower-level demands, the analogy is false.

Chapter 4

1 This assumption is implicit in the equilibrium data base. See St-Hilaire [1990, 27].

2 In the equilibrium data set, the federal debt is assumed to be held in proportion to federal interest payments. Provincial debt is held domestically and therefore does not enter into the model as no distinction is made between the residents of regions and regional government. In the sovereignty/

association scenario, where Quebec breaks its fiscal ties with the federal government, it is assumed that Quebec takes on its share of the debt. For the sake of convenience, this is assumed to be 25.1 per cent which is just equal to Quebec's holdings of federal debt. Because of the perfect mobility of capital and our assumption that there are no changes in risk premia, the budget constraints of the federal government, Quebec residents and the Quebec government remain unchanged. This treatment of the debt differs from that of Péloquin et al. [1992] and is the most neutral of possible assumptions implying, as it does, no change in individual debt burden or interest rates.

3 The activity indicator used was regional GDP for all categories, except income tax, where we used personal income.

4 Quebec receives special abatements equal to 16.5 tax points. Three of these are associated with youth allowances and entered in the national accounts as if they were federal transfers to persons. Thirteen and one half (13.5) associated with EPF and postsecondary education require special treatment. For more detail on these programs see *The National Finances* [Canadian Tax Foundation 1991, 16:19-20, Table 16.2]. The values for the abatement in 1984-1988 were taken from Department of Finance worksheets *"Quebec abatement"* [Department of Finance, December 1991].

5 Data on the abatement is available on a fiscal year basis only. It is adjusted in the same manner as the FMS expenditure data (see Appendix A) to ensure the correspondence with the PEA data used in the model. In addition, the value of the abatement is adjusted to account for inflation and real economic growth between 1984 and 1988, in the same manner as all other fiscal values in the model report this ratio along with the other ratios used in updating the economic structure.

6 If we were to abolish the abatement in the status quo, government transfers to Quebec would be increased by the full $1.34 billion. Federal income tax rates would rise by an amount sufficient to increase collections by $1.34 billion and provincial rates in Quebec would fall by the same amount. The combined income tax rate faced by individuals would remain unchanged and the budget of both the federal and provincial governments remain unchanged. There would, therefore, be no change in prices or behaviour.

7 After simulation, the actual revenue collected may differ from the change in responsibilities. Because the model enforces a regional budget and external balance constraint any excess (shortfall) revenues will (not) be spent thereby maintaining balance. External balance ensures that the value of regional imports less exports equals net transfers received for each region. See St-Hilaire [1990] for more detail.

8 Mathematically, for each region, i, the desired change in expenditures, ΔX_i^*, is equal to the sum of increased transfers to the regional government plus increased transfers from that level of government and increased expenditures on goods and services.

$$AF_i = \frac{\Delta X_i^*}{R_i^0}$$

This is divided by the total of preshock tax revenues, R_i^0, to arrive at the adjustment factor AF_i, for each jurisdiction. The J, postshock tax rates t_{ij}^1 for each jurisdiction are arrived at by multiplying the preshock rates by the adjustment factor.

$$t_{ij}^1 = AF_i \times t_{ij}^0 \qquad \forall\ i, j$$

The actual change in revenues, ΔR_i, is given by the difference between the pre-and postshock tax rates multiplied by the appropriate pre- and postshock activity levels AL_i.

$$\Delta R_i = R_i^1 - R_I^0 = \sum_{j=0}^{J} t_{ij}^1 \times AL_{ij}^1 - \sum_{j=0}^{J} t_{ij}^0 \times AL_{ij}^0$$

9 The Harris study also ran simulations which assumed monopolistic competition in several sectors. Under these assumptions the benefits of the FTA were much higher.

10 The Hamilton and Kuo paper does not report welfare impacts per se. It is therefore unclear whether the real output improvement reported here constitutes a valid comparison. We report welfare changes because changes in output are desirable only if they lead to increased welfare. Regional GDP the extensive decentralization scenario changes by –2.79 per cent in the Atlantic and plus 0.79 per cent in Alberta.

Chapter 5

1 This particular modelling of the equalization rule is somewhat simplistic as the distribution of equalization payment is fixed. The actual manner in which equalization payments are calculated is considerably more complicated. Appendix B includes a section describing the sensitivity of results to the ratio employed in the equalization rule.

Independent of the manner in which equalization payments are determined, it is not clear what form the equalization system would take under any of the new confederation scenarios modelled. One might alternatively assume that the level of equalization would remain unchanged as the structure of fiscal federalism is changed. Under this assumption, provinces who are recipients of equalization fare less well and those who are net contributors to the program fare better.

2 Appendix A describes in more detail the calculations for each of the five scenarios modelled.

3 It is entirely possible, in cases where significant change is undertaken, that the impact of the unmeasured institutional and attitudinal changes might greatly exceed these "best" case results.

4 A break out of the terms-of-trade component of the regional welfare impact is provided in Appendix B.

5 Unlike transfers, we have no information on the distribution of program specific spending across provinces. As a result, we use the distribution of total federal expenditures on goods and services (from the input-output tables) as a proxy.

6 Because the initial federal tax revenue and transfer data from which the changes in revenue and expenditure are calculated incorporates the abatement, the magnitude of the cuts in Quebec are masked. When EPF expenditures are cut in the model, federal taxes rise by the amount of the abatement in Quebec and expenditures fall by the amount of the EPF. Were the federal government not to create tax room by lowering its tax rates, the policy change would appear as a large reduction in federal expenditures in ROC and an increase in federal revenue in Quebec, as well as a relatively small reduction in expenditures. Given that the federal government does make room, federal revenues fall in all regions. The net effect in Quebec, however, is a small cut in expenditures (equal to the cash component of EPF and goods and services spending and a small cut in revenues equal to reduced federal expenditures *net* of the additional tax revenue from the cancelled abatement).

7 Normally, economists say that *ceteris paribus*, an increase in exports is a good thing. In the model, as in the real world, however, all things are not equal and it is for this reason that an increase in exports need not be an a priori positive development.

8 In the sovereignty/association scenario we proceed somewhat differently. Quebec's participation in federal programs is reduced to zero. The benefits which Quebecers will draw from federal spending will similarly be nil. In the sovereignty/association scenario, the gain (loss) of the federal government is shared among the remaining Canadian regions.

9 Equalization increases by $1.6 billion in Atlantic Canada, $2 billion in Quebec and $0.7 billion in the Prairies. Not all of this is net gain as the equalization is paid for, in part, by increased federal taxes in the recipient regions.

10 A related question revolves around the implicit subsidies inherent in the various supply management systems which operate in Canada. Here the subsidization takes the form of higher-than-world prices for domestic sales due to restricted supplies. The system tends to work to the advantage of producers in the central provinces who have most of the quotas. Furtan and Gray [1991] have estimated the value of the quotas for producers in the regions. The redistributive impact of these indirect subsidies is difficult to estimate as a considerable proportion constitutes an intraregional transfer of wealth from consumers to producers. There would appear to be, nonetheless, a net transfer from consumers in the western and eastern provinces to producers in the central provinces of Quebec. These impacts have not been accounted for in the present analysis.

	Value of subsidy
	(Millions of 1989 dollars)
Quebec	569
Ontario	583
Manitoba and Saskatchewan	133
Alberta	121
British Columbia and Territories	158

Source: Furtan and Gray [1989].

11 More specifically, welfare losses, stated as a percentage of regional GNP, were:

	Welfare losses
	(Per cent of regional GNP)
Atlantic Canada	–6.43
Quebec	–6.07
Ontario	–5.53
Manitoba/Saskatchewan	1.43
Alberta	32.01
British Columbia and Territories	–2.82

Source: Calculations by author, based on HEVs of Table 5-8 and regional GNP (Income) Table 4-6, Whalley and Trela [1986].

Chapter 6

1 Federal payments on the public debt in 1988 were $31,882 million. Assuming Quebec takes a 25 per cent share of that debt (the assumption implicit in the model) and that the interest rate charged on Quebec debt (r_Q) is different from the rate charged on federal debt (r_F) then the increase in debt service charges (ΔSC) is given by

$$\Delta SC_Q = 0.25 \times 31{,}882 \times (1 - \frac{r_Q}{r_F})$$

If we use the interest rate paid on new borrowing in 1988 on a weighted average of 90 days and 20 year rates, 11.25 versus 9.98 (see Péloquin et al. [1992]) then the change is equal to $992 million. If instead we use the five-year average of new issue rates for the period 1986-91 (7.413, 6.104) then the increase in service charges would be $1,670 million.

2 Public goods are goods (like national defence, clean air/water) which cannot be consumed by one individual without all individuals enjoying their benefits.

3 This point may become moot as these programs are under risk in the current round of GATT.

Grady [1991] cites a loss of 0.5 per cent of regional GDP on the basis of lost market share and lost subsidies. In the long run, resources would move to their most efficient use and the only loss would be the direct subsidy, $125 million in 1988, and the indirect subsidy from the higher world prices – estimated at between $155 and $200 million.

Looking at the milk quotas in isolation is in some sense unfair as there exist a whole series of programs which must also be considered, some of which benefit Quebec and some which do not. Furtan and Gray [1991] estimate that Quebec's net indirect subsidy in agricultural products amounts to $569 million. Quebec, however, is a net importer of agricultural produce.

Appendix B

1 Winer and Gauthier [1982], among others, have conducted extensive research into interprovincial mobility. The focus of these works has been somewhat different from our own. By and large, these studies have sought to measure the influence of specific programs on mobility. We, on the other hand, need a measure of the impact of differences in income levels.

2 It should be noted that the manner in which increasing returns to scale are modelled here differs from that used in the Free Trade debate. Specifically, whereas the models of Cox and Harris incorporated a notion of imperfect monopolistic competition, our model uses a much simpler scale parameter to introduce increasing returns to scale in manufacturing.

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